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# Review of implementation of Agenda 21 and the Johannesburg Plan of Implementation: chemicals

## Report of the Secretary-General

*Summary*

Significant progress has been made in attaining the 2020 goal on sound management of chemicals, set at the World Summit on Sustainable Development, through the Strategic Approach to International Chemicals Management, the implementation of related international legal instruments, the strengthening of information-sharing and risk communication, the establishment of programmes on risk assessment, reduction and prevention, and the development of indicators and monitoring. Major groups have made important contributions to the promotion of chemical safety. This progress has not, however, been sufficient globally, with implications for the health and welfare of millions of people. The increasing production and consumption of chemicals in the developing countries and countries with economies in transition strains those countries' capacity for sound management of chemicals. Sound chemicals management is frequently accorded low priority in development plans and is consequently under-resourced. In many cases, national legislation and policies need to be updated. Lack of public awareness of potential health and environmental risks and lack of resources and human capacity to manage and reduce risks are challenges of increasing urgency. More active engagement of multiple stakeholders will be critical to addressing them.

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# I. Introduction

1. The present report reviews progress in the implementation of Agenda 21,[1] the Programme for the Further Implementation of Agenda 21[2] and the Plan of Implementation of the World Summit on Sustainable Development ("Johannesburg Plan of Implementation")[3] in the thematic area of chemicals. It takes into account decisions of the second, third and fifth sessions of the Commission on Sustainable Development. The report was jointly prepared by the Department of Economic and Social Affairs of the Secretariat and the United Nations Environment Programme (UNEP). It draws on inputs provided by Governments, major groups and the United Nations system, in particular the Strategic Approach to International Chemicals Management (SAICM), the Inter-Organization Programme for the Sound Management of Chemicals (IOMC), the Intergovernmental Forum on Chemical Safety (IFCS), the Stockholm Convention on Persistent Organic Pollutants, the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, the World Health Organization (WHO), the United Nations Institute for Training and Research (UNITAR) and the Economic Commission for Europe (ECE).

## A. Background and context

2. Chemicals have played an indispensable role in fostering economic growth, improving standards of living and protecting public health. At the same time, if not managed soundly, they can pose significant dangers for the environment and society. As a result of this tension, chemicals have played a central role in the evolution of the concept of sustainable development.

3. While evidence of the human use of chemicals — for hygienic or medicinal purposes or for protection of crops or processing of metals or minerals — dates back to the earliest historical periods, the production as well as consumption of chemicals accelerated dramatically with the industrial revolution, and especially after the Second World War. The large-scale use of DDT as a disinfectant and pesticide contributed to disease control as well as crop protection and agricultural improvement. Two decades later, the discovery of longer-term adverse effects of DDT on humans as well as nature, especially as documented in Rachel Carson's *Silent Spring*, ushered in the sustainability revolution.

4. Since then, the approach to chemicals has evolved through several stages. In the first stage, mainly at the national level in developed countries, beginning in the 1960s and 1970s, a number of tools and approaches were developed, including outright banning of certain chemicals, establishment of maximum allowable limits (air quality standards or environmental quality standards), incentive systems

[1] *Report of the United Nations Conference on Environment and Development, Rio de Janeiro, 3-14 June 1992*, vol. I, *Resolutions adopted by the conference* (United Nations publication, Sales No. E.93.I.8 and corrigendum), resolution 1, annex II.

[2] General Assembly resolution S-19/2, annex.

[3] *Report of the World Summit on Sustainable Development, Johannesburg, South Africa, 26 August-4 September 2002* (United Nations publication, Sales No. E.03.II.A.1 and corrigendum), chap. I, resolution 1, annex.

(e.g., cap and trade arrangements) for internalizing environmental externalities, collection and dissemination of relevant data and funding of research on the long-term impacts of chemicals on human health and environment.

5. While the responsibility to protect citizens from chemical risks rests mainly on national Governments, awareness of transboundary and global dimensions of the issues began to emerge by the early 1980s. These concerns were triggered by evidence of ozone depletion, the transboundary impact of acid rain and trade in hazardous materials, often to bypass strengthened regulations and restrictions in developed countries. The possibility of dumping wastes in developing countries, many of which did not have appropriate technical, financial or institutional resources to manage the impact, led to a new round of action, this time at the international level, to regulate international trade in hazardous substances. Over time, these policy initiatives led to the incorporation of relevant provisions in trade agreements, and provisions for capacity-building, technological cooperation and information-sharing.

6. A related round of policy actions, which also began in the 1980s, sought to address the global dimension of the problem, especially the case of ozone-depleting substances. This led to a combination of regulation (phase-out of chlorofluorocarbons (CFCs) and other ozone-depleting substances), incentives and international cooperation.

7. A fourth round of conceptual and policy development was triggered by the integrating vision of the United Nations Conference on Environment and Development and the Commission on Sustainable Development process, which laid the basis for joint action by developed and developing countries and by different stakeholders (Governments, businesses and civil society), and for the integration of environmental, developmental and social goals. This round has led to a number of important conceptual innovations and policy tools, including sound management, prior informed consent, technical cooperation and capacity-building for chemicals management and information-sharing.

8. Chapter 19 of Agenda 21 brings these strands together under the title of sound management of chemicals, which includes prevention, reduction, remediation, minimization and elimination of risks during their production, storage, transport, use and disposal, including the risks from chemicals in products and articles. The chapter proposes six programme areas for further work: (a) expanding and accelerating international assessment of chemical risks; (b) harmonization of classification and labelling of chemicals; (c) information exchange on toxic chemicals and chemical risks; (d) establishment of risk reduction programmes; (e) strengthening of national capabilities and capacities for management of chemicals; and (f) prevention of illegal international traffic in toxic and dangerous products.

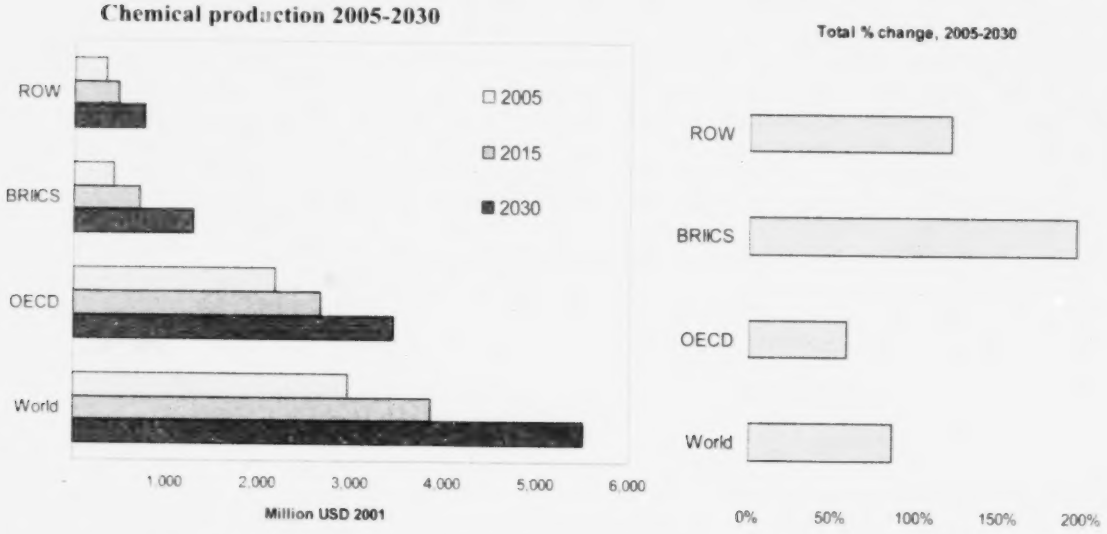
9. Section II of the present report provides a brief progress report on international agreements and policy actions on chemicals within the context of sustainable development. Following a review of the status of legal instruments, the section looks at progress in the six thematic areas listed above. Finally, Section III identifies the major gaps in implementation and the way forward.

## B. Chemicals and sustainable development

10. As of December 2009, the Chemical Abstract Services Registry database[4] listed nearly 51 million natural or man-made chemicals, a number that has quadrupled since the first session of the Commission on Sustainable Development in 1993 with the addition of over 4,000 new chemicals every day. However, since most are not produced on a commercial scale, only about 1,000 new chemicals enter the market every year. In economic terms, in 2008, the chemicals industry had total sales of over $3 trillion[5] and employed 7 million people directly and supported another 20 million jobs in ancillary activities.[6]

11. While the bulk of chemicals production and consumption still takes place in countries of the Organization for Economic Cooperation and Development (OECD), the balance is shifting rapidly towards developing countries and countries with economies in transition. Under current trends, by 2020, the share of the latter group of countries in both production and consumption of chemicals will rise close to one third. This poses a management challenge to these countries, as many will need to strengthen their human and technical capacities to deal with the associated risks.

**Chemical production 2005-2030**




*Abbreviations*: BRIICS, Brazil, Russian Federation, India, Indonesia, China and South Africa; ROW, rest of the world.

*Source*: OECD, *Environmental Outlook to 2030*, 2008.

12. The management challenge extends into many domains, including the need for appropriate technical skills and capacities, mechanisms for information management and dissemination, and fragmentation of decision-making.

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[4] See www.cas.org/cgi-bin/cas/regreport.pl.

[5] International Council of Chemical Associations, "Innovations for greenhouse gas emission reductions", 2009.

[6] International Council of Chemical Associations, progress report 2009.

13. Given the cross-sectoral nature of the issue, the regulation and management of chemicals in most countries is spread over several sectoral ministries — including agriculture, industry, labour, environment and health — and among several agencies within each ministry. Although initial steps towards policy coherence have been taken by many developing countries and countries with economies in transition — including through inter-ministerial committees, national focal points or integrated implementation plans — much more needs to be done.

# II. Review of progress

## A. International cooperation on chemicals and sustainable development

### 1. International legal instruments on chemicals

14. Today, the sound management of chemicals is addressed by 17 different multilateral agreements,[7] including the Food and Agriculture Organization of the United Nations (FAO) International Code of Conduct on the Distribution and Use of Pesticides (1985), the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (1989), the Montreal Protocol on Substances that Deplete the Ozone Layer (1989), the Convention on Safety in the Use of Chemicals at Work (International Labour Organization (ILO) Convention No. 170) (1990), the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (1998), the International Maritime Organization (IMO) International Convention for the Prevention of Pollution from Ships, the Stockholm Convention on Persistent Organic Pollutants (2002) and the International Health Regulations (2005).

**Ratification and implementation status of the main international legal instruments relating to chemicals management (as of 10 February 2009)**

| | | | SC | | | | | |
|---|---|---|---|---|---|---|---|---|
| *Region* | *BC* | *RC* | *SC* | *NIP* | *MP* | *ILO* | *MARPOL* | *IHR* |
| Africa | 48 | 37 | 48 | 28 | 53 | 3 | 33 | 53 |
| Asia-Pacific | 42 | 30 | 43 | 18 | 54 | 4 | 38 | 55 |
| Central and Eastern Europe | 25 | 17 | 20 | 12 | 25 | 1 | 22 | 25 |
| Latin America and the Caribbean | 30 | 21 | 29 | 11 | 33 | 4 | 29 | 33 |
| West European and others | 26 | 21 | 21 | 18 | 27 | 5 | 25 | 27 |
| **Total** | **172** | **127** | **162** | **88** | **194** | **17** | **147** | **194** |

*Source*: Strategic Approach to International Chemicals Management, document SAICM/ICCM.2/INF/1.

*Abbreviations*: BC, Basel Convention; RC, Rotterdam Convention; SC, Stockholm Convention; NIP, Stockholm Convention national implementation plan; MP, Montreal Protocol; ILO, ILO Convention No. 170; MARPOL 73/78, International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto; IHR, International Health Regulations (2005).

[7] UNEP, *Global Environment Outlook-4*, 2007, available at www.unep.org/geo/geo4/media/.

15. One of the earliest instances of international action to regulate the use of chemicals is the FAO International Code of Conduct on the Distribution and Use of Pesticides. The general population is more likely to be exposed to pesticides than to any other toxic chemicals because pesticides are: (a) designed to be toxic; (b) intentionally dispersed into the environment; (c) often handled by less educated or untrained people; and (d) commonly applied to food crops. The population of developing countries is particularly vulnerable because of a high percentage of people working in agriculture and inadequate training in judicious use and handling of these substances, and lower levels of monitoring of concentration in food and the environment. Adopted in 1985 and revised in 2002, the Code of Conduct provides guidance on the management of pesticides throughout their life cycle for all private and public entities. It has been endorsed by 192 FAO member States, and is supported by technical guidelines by an international expert panel giving practical advice. As of July 2009 around 31 guidelines had been developed.

16. The Basel Convention (see www.basel.int) was adopted in 1989 and came into force in 1992. It aims to protect human health and the environment against the adverse effects of the generation, management, transboundary movements and disposal of hazardous and other wastes, including the trade of chemicals at the end of their life cycle. It also strengthens measures applied to the entire waste cycle. In article 4.1, the Convention pioneered application of the prior informed consent procedure. Technical assistance and guidelines on the environmentally sound management of specific hazardous waste streams and further guidance material are provided as a support to developing countries and countries with economies in transition.

17. The Montreal Protocol entered into force in January 1989. It requires its parties to eliminate the production and import of nearly 100 chemicals, mostly halogenated hydrocarbons with ozone-depleting properties. The Protocol was one of the first international environmental agreements that included trade sanctions to achieve the stated goals. The Protocol has become "perhaps the single most successful international agreement to date".[8] All States Members of the United Nations have ratified the Protocol.

18. ILO Convention No. 170 and its accompanying Recommendation defined responsibilities of the competent authority, suppliers and employers, and duties and rights of workers, in implementing risk reduction measures in the workplace. The Convention, inter alia, emphasized the need to harmonize classification and labelling of chemicals, later implemented through the globally harmonized system of classification and labelling of chemicals (see para. 45 below). Besides Convention No. 170, the Convention concerning the Prevention of Major Industrial Accidents (ILO Convention No. 174)[9] and the Convention on the Transboundary Effects of Industrial Accidents[10] are also aimed at reducing risks from industrial accidents involving chemicals. The latter Convention has 39 parties, all from the ECE region, and includes some cross-cutting policies, e.g., on land-use planning generally, going beyond the siting of potentially hazardous installations.

19. The Rotterdam Convention (see www.pic.int) was adopted in 1999 and entered into force in 2004. It creates legally binding obligations for the implementation of

[8] Quotation from former Secretary-General Kofi Annan, on www.unep.org.

[9] Text at www.ilo.org/ilolex/cgi-lex/convde.pl?C174.

[10] Text at www.unece.org/env/teia/text.htm.

the prior informed consent procedure. Parties must decide whether they will allow the import into their territories of chemicals listed in annex III to the Convention, and must then notify the secretariat of their decision by submitting what is termed an "import response", indicating whether or not they consent to import, and under what specified conditions. Currently, 40 chemicals, listed in annex III to the Convention, are subject to the PIC procedure; these include 25 pesticides, 4 severely hazardous pesticide formulations, and 11 industrial chemicals. More chemicals are expected to be added in the future.

20. The Stockholm Convention (see www.pops.int) was adopted in 2001 and entered into force in 2004. It is a global treaty to eliminate or reduce the release of persistent organic pollutants. It initially targeted 12 substances or groups of substances; nine more were added in 2009 through a consensus decision of the parties. The Convention also includes provisions for helping developing countries and countries with economies in transition to phase out and clean up stockpiles of certain chemicals.

21. There is a strong support to enhance synergies among chemicals-related multilateral agreements. At their respective meetings in 2008 and 2009, the conferences of the parties to the Basel, Rotterdam and Stockholm Conventions agreed to enhance cooperation and coordination to strengthen implementation of the Conventions at the national, regional and global levels.

22. In order to enhance coordination within the United Nations system, the Inter-Organization Programme for the Sound Management of Chemicals (IOMC) was established in 1995. Its goal is to increase the coherence and effectiveness of chemicals programmes of participating organizations (FAO, ILO, UNEP, the United Nations Industrial Development Organization (UNIDO), UNITAR, WHO and OECD) as well as observers (UNDP and the World Bank).

Box 1
**Worldwide consumption of CFCs**

One example of successful international governance on chemicals is the reduction of the use of ozone-depleting substances. According to the internationally agreed phase-out schedules under the Montreal Protocol, the consumption of CFCs has been totally phased out in developed countries, and the phasing out in developing countries is being implemented ahead of schedule.

*Source*: UNEP, *Global Environment Outlook-4*, 2007.

23. In addition to the adopted legal instruments on chemicals, the international community continues to assess the need for additional international action, for example on mercury. In February 2009, the Governing Council of UNEP requested the Executive Director of the Programme to convene an intergovernmental negotiating committee with the mandate to prepare a globally legally binding instrument on mercury. The committee was to commence its work in 2010 with the goal of completing it in 2013.

## 2. Strategic Approach to International Chemicals Management

24. The focus provided by Agenda 21 on the sound management of chemicals led to a number of developments which culminated in 2006 with the adoption of the Dubai Declaration on International Chemicals Management and the formal establishment of the Strategic Approach to International Chemicals Management (SAICM). At its second, third and fifth sessions, held in 1994, 1995 and 1997 respectively, the Commission on Sustainable Development assigned the responsibility for sound management of chemicals throughout their life cycle to those responsible for their production.[11] Paragraph 23 of the Johannesburg Plan of Implementation went further to call for a strategic approach to the issue.

25. The Johannesburg Plan of Implementation set the target date of 2020 for ensuring that all chemicals are used and produced in ways that lead to the minimization of significant adverse effects on human health and the environment.[12] SAICM is not intended to replace existing binding or non-binding instruments, but to serve as a voluntary policy framework to build upon such instruments.[13]

26. A few features of SAICM need to be mentioned. First, its regional cooperation model is considered instrumental to progress in implementation. The SAICM Overarching Policy Strategy notes that "regional meetings will facilitate input on activities, preparation for future meetings, and exchange of regional expertise and information".[14] Each regional group has established a focal point and nominated regional representatives to the Executive Board of the SAICM Quick Start Programme. Africa, Central and Eastern Europe and Latin America and the Caribbean have developed multi-stakeholder coordination committees to facilitate regional SAICM implementation.

27. Second, in line with the provisions of various international instruments, SAICM endorses an open and multi-stakeholder participatory approach. One concrete manifestation is that six international networks of non-governmental organizations[15] have registered as the SAICM non-governmental focal points and are working together to promote SAICM implementation in all regions. They have documented more than 300 activities conducted by public interest organizations, which include work on 68 of the 273 items in the SAICM Global Plan of Action. Other public health and environmental organizations and trade unions have also made important contributions to the promotion of chemical safety. Similarly, the private-sector efforts to promote chemical safety include such voluntary initiatives as the Responsible Care programme (see www.responsiblecare.org).

28. Third, the inter-agency coordinating role of IOMC is highly relevant to the implementation of agreed SAICM priorities. The SAICM Global Plan of Action lists nearly 220 activities that identify one or more IOMC organizations as an actor.

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[11] See E/1994/33/Rev.1, E/1995/32 and E/1997/29.

[12] Johannesburg Plan of Implementation (note 3 above), para. 23.

[13] These are referred to in section VI of the SAICM Overarching Policy Strategy, available at www.saicm.org/documents/SAICM%20texts/standalone_text.pdf.

[14] Ibid., para. 26 (a).

[15] Health Care Without Harm; International POPs Elimination Network; International Society of Doctors for the Environment; Pesticide Action Network International; Women in Europe for a Common Future; and World Federation of Public Health Associations.

## B. Risk assessment

29. Risk assessment is the first step in the identification and deployment of measures to minimize the adverse effects of chemicals on humans and the environment.

30. Risk is defined as a combination of three factors: hazard, exposure and vulnerability. The risk from a chemical is directly proportional to its intrinsic hazardous properties, such as reactivity, toxicity, ecotoxicity, persistence in the environment or bioaccumulation. All chemicals are intrinsically hazardous; the only difference is in the dose required to cause significant adverse effects. Governments agreed at the United Nations Conference on Environment and Development that efforts to assess chemical hazards at the international level need to be expanded and accelerated. For exposure evaluations, the local circumstances need to be taken into consideration. Besides the hazard, risk is determined by the probability of exposure of humans or the environment and the vulnerability of the relevant population.

### 1. Hazard assessment

31. Chapter 19 of Agenda 21 calls for expanded and accelerated efforts at the international level, including increased coordination among the United Nations agencies and other relevant organizations, to assess chemical hazards. Paragraph 23 of the Johannesburg Plan of Implementation explicitly reiterates this call. While progress has been made in OECD countries on hazard and exposure assessment, it is behind schedule. Moreover, significant gaps remain in making this knowledge accessible and operational in non-OECD countries.

32. With around 1,000 new chemicals introduced to the market annually, national authorities in most developed countries have transferred some of the hazard assessment burden to the industry. However, the final assessment and resulting regulatory action still has to lie with the government authorities. In most cases, the information for hazard assessment is provided by those responsible for production or marketing of chemicals. This is done through standardized tests, which may generate toxicological data (for the effects on humans) or eco-toxicological data (for the effects on the environment).

33. Methodologies for testing and assessing chemical hazards have mainly been developed through collaboration among OECD countries. The international compilation has been organized under the joint WHO/UNEP/ILO International Programme on Chemical Safety (IPCS) and the International Agency for Research on Cancer (IARC). Although resource constraints have slowed the pace, efforts have been made in developing the concise international chemical assessment documents. Since 1998, 75 such documents have been produced. IARC has since 1971 evaluated the carcinogenic potential of more than 900 agents (not just chemicals), of which approximately 400 have been identified as carcinogenic or potentially carcinogenic to humans.

34. In 1991, OECD countries started a programme on initial hazard assessments of high production volume chemicals (those produced or imported in excess of 1,000 tons per year in at least one country or region). The programme envisioned around 200 chemicals being assessed per year. However, due to financial, human resources and other constraints, only around 1,000 chemicals have so far been assessed.

### 2. Exposure assessment

35. Risks can only be determined if there is information on exposures or exposure potential. To assess exposure potential one has to understand the behaviour of a chemical in the environmental media under different conditions. Again, relevant agencies in OECD countries have developed models for such assessment. While some of these are applicable to non-OECD countries as well, the differences in environmental and exposure conditions may require additional information. These countries also would be helped if simplified or generic models could be developed for application to different climates and environmental conditions.

### 3. Challenges

36. Risk assessment requires specialized technical and scientific knowledge. In most non-OECD countries, there is limited capacity to assess and manage the risks from pesticides, whereas the capacity to assess and manage the risk from industrial chemicals is generally absent.

37. There is an urgent need to reinforce the capacities of these countries for assessing chemical risks. Coherent international tools and guidelines on chemical risk assessment, which also reflect the environmental perspective, are urgently needed. These assessment tools and methodologies need to be adapted to the national environmental, social and economic conditions.

## C. Information exchange and risk communication

38. Access to and exchange of information is fundamental to attaining the 2020 goal. Although more information on chemicals has been available since the World Summit on Sustainable Development, there is still significant room for improvement, in particular for dissemination and exchange of information on chemical safety matters, including the potentially hazardous chemicals in products.

### 1. Pollutant release and transfer registers

39. Pollutant release and transfer registers are systems to collect and disseminate information on environmental release and transfers of toxic chemicals from industrial and other facilities. They were established in several countries after the 1984 Bhopal disaster. The United Nations Conference on Environment and Development affirmed the "right to know" of communities and workers about toxic chemicals and other substances of concern. The Johannesburg Plan of Implementation, in paragraph 23 (f), encouraged development of coherent and integrated information on chemicals, such as through national pollutant release and transfer registers.

40. After the United Nations Conference on Environment and Development, a guidance manual for establishing pollutant release and transfer registers has been developed through a multi-stakeholder approach. The manual has served as the basis in many countries for capacity-building activities for the introduction of registers. Currently 23 countries have established a functioning national register. Many more are in the process of developing their national reporting system (see www.prtr.net).

41. Pollutant release and transfer registers offer an established, proven multi-stakeholder mechanism capable of providing periodic and reliable data on releases

and transfers of pollutants of national priority. Many of the global environmental agreements, including SAICM and the Stockholm Convention, have recognized and endorsed pollutant release and transfer registers as an effective mechanism in achieving their goals.

42. The Protocol on Pollutant Release and Transfer Registers was adopted at a meeting of the parties to the ECE Aarhus Convention in May 2003.[16] The Protocol is the first legally binding international instrument on pollutant release and transfer registers. Presently it has 19 ratifications,[17] and is open to participation by all States Members of the United Nations.

43. Lack of institutional capacity and a deficiency in laboratory infrastructure are major barriers to pollutant release and transfer registers. Furthermore, while some countries have implemented registers, their effectiveness is restricted by the limited number of chemicals covered, their dependence on industry estimations with very little monitoring or review, and the specific challenges pertaining to release from diffuse sources.

Box 2
**Legislative structure on chemicals management in the European Union**

The European Union has adopted REACH, which is the acronym for the Regulation for Registration, Evaluation, Authorization and Restriction of Chemicals. It entered into force on 1 June 2007 and aims to streamline and improve the legislative framework on chemicals of the European Union. REACH makes industry bear most responsibilities for managing the risks posed by chemicals and providing appropriate safety information to their users.

### 2. Harmonization of classification and labelling of chemicals

44. Significant progress has been made in developing a globally harmonized system of classification and labelling of chemicals. The universal adoption of this system will provide a basis for uniform identification of chemical hazards, improve hazard communication, facilitate trade in chemicals, reduce the need for animal studies and ultimately improve overall human and environmental safety in the production, transport, use and disposal of chemicals.

45. After the United Nations Conference on Environment and Development, ILO, OECD and the United Nations Committee of Experts on the Transport of Dangerous Goods cooperated to elaborate the globally harmonized system of classification and labelling of chemicals. The system contains all criteria necessary for classification of chemicals according to their intrinsic hazardous properties (physical hazards such as flammability, hazards to health and hazards to the environment), as well as all necessary provisions for hazard communication through labelling (identification of

[16] The meeting took place in the framework of the fifth Ministerial Conference "Environment for Europe", held in Kyiv from 21 to 23 May 2003.

[17] Includes ratifications, approvals, acceptances and accessions as of 10 August 2009.

chemical, pictogrammes, symbols, hazard statements, precautionary statements or signal words) and safety data sheets.

46. In 1999, the Economic and Social Council decided to establish the Subcommittee of Experts on the Globally Harmonized System of Classification and Labelling of Chemicals.[18] The first task of the Subcommittee was to make the globally harmonized system available for worldwide use and application. The first version of the document (ST/SG/AC.10/30), which was intended to serve as the initial basis for the global implementation of the system, was published in 2003. First, second and third revised versions were published in 2005, 2007 and 2009 respectively.

47. The Johannesburg Plan of Implementation encouraged countries to implement the globally harmonized system as soon as possible with a view to having the system fully operational by 2008. Such an objective was ambitious and has not yet been met. Legal instruments implementing the system have entered into force: New Zealand, Mauritius, the Republic of Korea and all countries members of the European Union and the European economic area. Other countries, in particular all those which participate in the meetings of the Subcommittee of Experts as well as Chile, Malaysia and Singapore, continue to revise and amend their legal texts, standards and guidelines to achieve implementation of the system as soon as possible.

### 3. Implementation of the prior informed consent procedure

48. The prior informed consent procedure assists countries in avoiding imports of hazardous chemicals that cannot be managed safely under national conditions. Chapter 19 of Agenda 21 called for the implementation of the prior informed consent procedures as soon as possible.[19] Built upon the voluntary prior informed consent procedure initiated by UNEP and FAO, the text of the Rotterdam Convention was adopted in 1998.

49. The Rotterdam Convention requires that chemicals and pesticides that have been added to the Convention because they are banned or severely restricted in at least one country in each of two regions shall not be exported unless explicitly agreed by the importing country. It also includes severely hazardous pesticide formulations that are too dangerous to be used in developing countries.

### 4. International networks and projects for information on chemicals

50. The functions of the SAICM secretariat include information clearing-house services to provide advice to countries on implementation, refer requests for information to relevant sources and generally facilitate access to information and expertise. The technical infrastructure of this information clearing house is essentially ready.[20]

51. SAICM has also assumed charge of the Information Exchange Network on Capacity Building for the Sound Management of Chemicals, which was established under IFCS. The Network is an Internet-based gateway to information for capacity-building.

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[18] Resolution 1999/65 of 26 October 1999.

[19] Agenda 21 (note 1 above), para. 19.39 (d).

[20] SAICM document SAICM/ICCM.2/7.

52. A globally harmonized system for data collection on human poisonings, toxic exposures and chemical incidents has been developed by the IPCS INTOX programme, with the involvement of experts from over 60 countries. The database provides information for poison centre professionals and clinical toxicologists, and is available in many languages.

53. The international chemical safety cards is another project undertaken by IPCS in collaboration with the European Commission. The cards offer essential health and safety information on chemicals for use at the "shop floor" level by workers and employers in factories, agriculture, construction and other places of work. They are particularly useful in less developed areas and in small and medium-size enterprises.[21] WHO, in collaboration with ILO, continues to produce and update hundreds of safety cards each year. The cards have been translated into 24 languages and are available on the Internet in 17 languages.

## D. Risk reduction and prevention

54. The principal tools of risk reduction are the substitution of harmful chemicals and the minimization of exposure to toxic chemicals through prevention, reduction or elimination of contacts. Risk reduction is based on science-based risk assessment, taking into account the costs and benefits as well as the availability of safer substitutes.

### 1. General principles of risk reduction

55. Risk reduction is one of the five key SAICM objectives. The SAICM Global Plan of Action includes 79 concrete risk reduction activities.

56. The private sector has also been involved in risk reduction initiatives through the development of safer alternatives, affordable sustainable technologies and green chemistry and commitments such as Responsible Care and the Global Product Charter.

57. Chemicals that are most often subject to risk reduction measures are (a) persistent, bioaccumulative and toxic substances; (b) carcinogens or mutagens that adversely affect, inter alia, the reproductive, endocrine, immune or nervous systems; (c) persistent organic pollutants; (d) heavy metals such as mercury, lead, cadmium or chromium; (e) chemicals produced or used in high volumes; (f) chemicals subject to wide dispersive use, such as pesticides; and (g) chemicals with high acute toxicity or physical danger (e.g. explosives).

58. Risk reduction programmes need to take into account different vulnerabilities, particularly (a) safeguarding the health of women and children through minimization of chemical exposures before conception and through gestation, infancy, childhood and adolescence; (b) promoting occupational health and safety of workers, by means such as national inspection systems and occupational health and safety standards; (c) protecting watercourses or terrestrial ecosystems from pesticides or industrial chemicals, for example by limiting spraying zones, waste water treatment and control of air emissions. It is important to apply appropriately the precautionary approach in applying safety factors and exposure limits.

[21] See www.ilo.org/public/english/protection/safework/cis/products/icsc/.

Box 3

**Africa Stockpiles Programme**

The Africa Stockpiles Programme is a multi-agency effort to address unwanted pesticides in Africa by eliminating existing stockpiles of Persistent Organic Pollutants and obsolete pesticides and preventing recurrence of similar stockpiling. The programme was started in 2000 with the intention of eliminating obsolete pesticides in all African countries by 2015. The estimated cost is $250 million. The programme is implemented by FAO, the Global Environment Facility (GEF) and the World Bank. Phase one has been implemented in Ethiopia, Mali, Morocco, Nigeria, South Africa, Tunisia and the United Republic of Tanzania.

*Source*: www.africastockpiles.net.

## 2. Global risk reduction measures

59. Progress in global risk reduction measures is covered elsewhere in the report. These include regulations on transport of dangerous goods, phasing out of ozone-depleting substances and Persistent Organic Pollutants, guidelines on pesticides, reducing risks in the workplace and new work on a legally binding instrument for mercury. Two additional items that need to be mentioned relate to heavy metals, especially mercury and lead.

60. The UNEP Global Mercury Partnership is the main international mechanism for activities on mercury, with an overall goal of protecting human health and the global environment from the release of mercury and its compounds. The areas of work include mercury-related (a) management in artisanal and small-scale gold mining; (b) control from coal combustion; (c) reduction in the chlor-alkali sector; (d) reduction in products; (e) air transport and fate research; (f) waste management; and (g) supply and storage.

61. Paragraph 56 (b) of the Johannesburg Plan of Implementation called for the phasing out of tetraethyl lead in gasoline to combat outdoor air pollution. UNEP played a pivotal role in developing an action plan with a focus on sub-Saharan Africa. Another important initiative since 2002 is the global Partnership for Clean Fuels and Vehicles,[22] a multi-stakeholder initiative (with 90 partners from Governments, civil society, international organizations and academia) to support developing countries in reducing emission of toxic chemicals by improving fuels.

62. However, although tetraethyl lead is one of the chemicals listed in the Rotterdam Convention, it is still used as a fuel additive in many countries. Under the prior informed consent procedure, 85 per cent of import responses for tetraethyl lead indicated consent to import, which reflects the continued use of this chemical.

[22] See www.unep.org/pcfv/index.asp.

Box 4
**Impacts of chemicals on public health**

Over 25 per cent of the global burden of disease is linked to environmental factors, including exposure to chemicals. Some 800,000 children each year are affected by lead exposure. The highest exposures occur in developing countries. Lead exposure affects intelligence levels and accounts for 2 per cent of ischaemic heart disease burden and 3 per cent of the cerebrovascular disease burden. Outdoor pollution and occupational exposure to chemicals account for 5 per cent and 9 per cent respectively of the global lung cancer disease burden. Asbestos, which remains in use in some countries, is known to cause lung cancer and mesothelioma. Unintentional poisonings kill an estimated 355,000 people each year. In developing countries, such poisonings are associated strongly with excessive exposure to and inappropriate use of toxic chemicals, including pesticides.

*Source*: WHO, *Preventing disease through healthy environments: Towards an estimate of the environmental burden of disease*, 2006, available at www.who.int/quantifying_ehimpacts/publications/preventingdisease/.

### 3. Emerging issues

63. Risk reduction programmes are urgently needed to address some emerging issues, including the use of nanotechnology in food, agriculture and consumer products, biotechnology and the management of electronic waste (e-waste). Nanotechnology and e-waste, along with chemicals in products and lead in paint, were identified as "emerging policy issues" at the second session of the International Conference on Chemical Management. Action may include assessment, registration, labelling, tracking, information-sharing, public dialogue, monitoring and further research.

## E. Prevention of illegal traffic in toxic and dangerous products

64. Policies to promote chemical safety by regulating trade in dangerous substances were the earliest instance of international cooperation, including the Basel Convention. Agenda 21 defines the illegal traffic of chemicals as traffic carried out in contravention of a country's laws or applicable international instruments. Paragraph 23 of the Johannesburg Plan of Implementation recognized the importance of action against international illegal trafficking in hazardous chemicals and wastes, including the prevention of damage resulting from the illegal transboundary movement and disposal of such substances.

**Other instruments on regulating transboundary movement of dangerous goods**

65. One of the most important instruments for the prevention and control of illegal international traffic in chemicals is information-sharing and capacity-building of developing countries and countries with economies in transition. In this regard, the globally harmonized system (see para. 45 above) has been an important instrument for promoting consistency in national requirements. Similarly, the Rotterdam

Convention, besides being primarily an information-sharing tool, provides a mechanism for preventing illegal or unwanted trade in pesticides and related toxic chemicals by creating legally binding obligations for the implementation of the prior informed consent procedure.

66. The United Nations Recommendations on the Transport of Dangerous Goods (Model Regulations), elaborated by the Subcommittee of Experts on the Transport of Dangerous Goods, contain internationally adopted guidelines and principles that regulate the transport aspect of transboundary movement of dangerous goods. The 16th revised edition of the Model Regulations, published in 2009 (ST/SG/AC.10/1/Rev.16), contains requirements that are now fully integrated in all major legal instruments regulating international transport of dangerous goods by all modes of transport and are reflected in national regulations of most countries that produce, use or trade hazardous chemicals.

67. SAICM advocates the collaboration of Governments with the World Customs Organization in the dissemination and use of customs risk profiles and material safety sheets as official means of identifying probable cases of illegal traffic.

## F. Monitoring

68. Monitoring is an essential tool to follow the state of the environment and the effects of chemicals on human health and the environment over time, and thereby to assess the effectiveness of national, regional or global measures to manage the risks of chemicals. However, monitoring of effects is scattered and only available for a limited number of chemicals. Data are especially scarce in developing countries.

### 1. Progress on monitoring

69. The International Society of Exposure Science has been a forum for reporting environmental monitoring methods and results for the past two decades. Much of the data come from scientists in the OECD countries, but methods of modelling exposure in workplace and community settings are transferable to conditions in other parts of the world. For example, air pollution monitoring methods developed in the United States have been applied in an oil refining community in Durban, South Africa.

70. A large body of information on biomonitoring of human blood and tissues exists in the scientific literature. For example, childhood blood lead levels have been monitored in the United States and reported by the Centers for Disease Control for the past three decades. Similar biomonitoring of childhood lead levels exists in many other countries and has been incorporated in the global burden of disease estimates. Biomonitoring data on Persistent Organic Pollutants have also been collected and reported in scientific publications and at scientific meetings for at least the past two decades. The international meetings on dioxin (see www.dioxin20xx.org) originally focused on human and environmental levels of dioxin and related compounds, but in recent years have expanded to include reports of a wide range of other halogenated compounds. Some of this information has reached the level of consistency whereby it can indicate trends over time in different geographical regions.

### 2. Monitoring related to international policies

71. The progress of implementation of SAICM will be evaluated by the International Conference on Chemicals Management at its sessions in 2012, 2015 and 2020. Indicators have been created for each of the five objectives under the Overarching Policy Strategy of SAICM, in total 20 indicators.

72. The first global monitoring report on Persistent Organic Pollutants (UNEP/POPS/COP.4/33) indicated that, in the regions and subregions where data were available, levels of Persistent Organic Pollutants in humans and in the environment were decreasing. While these trends are encouraging, monitoring activities need to be sustained and also extended to other regions.

73. Since 1991, the Arctic Monitoring and Assessment Programme has been collecting environmental and biological samples to assess the impact of Persistent Organic Pollutants, mercury and lead, among other contaminants. The 2009 report[23] notes a decline in levels of PCBs and DDT, but increases in brominated flame retardants and perfluorinated compounds.

74. A number of international studies on air pollution and health are under way or have published findings in various regions, including North America, Central and South America, South Asia and China.

75. Indicators are also needed to assess the effectiveness of the efforts undertaken, as well as the measurement of capacity to address newer chemicals, in particular those produced and used in higher volumes.

## G. Means of implementation

76. Lack of financial resources and capacity is still a big obstacle to achieving sound management of chemicals, particularly in developing countries and countries with economies in transition. The rapid expansion of the chemical industry in developing countries and countries with economies in transition further strains the capacities of these countries.

### 1. Financing for sound management of chemicals

77. It is generally recognized that there are inadequate resources available to address chemical safety issues at national, regional and global levels, especially with regard to the main multilateral environmental agreements governing chemicals.

78. The new and additional funds needed for sound management of chemicals could run into billions of United States dollars per year. Existing bilateral and multilateral funding mechanisms do not project such volumes, nor have they attained the required level of long-term predictability and stability.

79. The allocation of resources to chemicals management in the budgets of developing countries and countries with economies in transition, or in requests for donor assistance, has to compete with other priority goals, including poverty

[23] *Arctic Pollution 2009*, available from www.amap.no.

eradication.[24] This calls for building greater synergies between poverty reduction strategies and sound management of chemicals.

80. In many non-OECD countries, chemicals management relies mainly on resources from bilateral donors and multilateral funds such as GEF and the SAICM Quick Start Programme for enabling activities. However, the Persistent Organic Pollutants window of GEF does not cover the broader issues related to sound management of chemicals. The resources available through the Quick Start Programme are very modest and only one project per country has so far been permitted. Furthermore, the Quick Start Programme is a time-limited programme, and there is little progress in developing a more permanent funding mechanism.

81. The volume of international assistance generally is below what is needed. In 2008, the Stockholm Convention secretariat assessed the needs of developing countries and countries with economies in transition for implementation of the Convention. It found that for the 2004-2009 period the implementation need was $3.3 billion compared with the Persistent Organic Pollutants funding level in GEF of $300 million — a more than 10-fold gap. That assessment covered only a few chemicals that are all largely phased out. The new Persistent Organic Pollutants and other problematic chemicals will require additional resources.

82. The one success story is the Multilateral Fund of the Montreal Protocol. It is a stand-alone financial mechanism to help developing country parties comply with the Protocol. It is the only global financial mechanism that is replenished with mandatory assessed contributions from developed countries. The Fund was replenished in 2008 with a further $490 million, bringing the total of funds close to $3 billion.[25]

Box 5
**The SAICM Quick Start Programme**

The Quick Start Programme is a voluntary, time-limited trust fund administered by UNEP to support enabling activities in developing countries and countries with economies in transition. It is open to contributions until 2012 and can make disbursements until 2013. Thus far, it has received $20 million from 21 donors and in-kind contributions, valued at over $23 million. Since May 2006, 82 projects (out of 185 applications) in 76 countries have been approved in the amount of $16 million.

83. SAICM foresees industry partnerships as one of the pillars of financial arrangements, but there are relatively few new partnerships, and the net financial contribution of existing partnerships is difficult to ascertain.[26]

[24] SAICM document SAICM/ICCM.2/13.
[25] SAICM document SAICM/ICCM.2/12.
[26] SAICM document SAICM/ICCM.2/12.

### 2. Technology transfer and technical cooperation

84. Technology transfer and cooperation are critical. Even when risks of certain chemicals to human health and environment posed are discovered, it is sometimes difficult for developing countries to replace them as they are highly effective and cheap to produce. Finding cost-effective and locally appropriate alternatives can be a technological and financial challenge for developing countries.[27] Often it is the production of the most toxic chemicals that is transferred to developing countries.

85. Most international agreements emphasize the importance of technology transfer and technical cooperation. SAICM emphasizes the need to strengthen partnerships and mechanisms to provide appropriate and clean technologies to developing countries and countries with economies in transition.

86. Article 12 of the Stockholm Convention includes a call for regional and subregional centres for capacity-building and technology transfer. In May 2009, the Conference of the Parties endorsed eight institutions for this purpose for a period of four years.

87. The National Cleaner Production Centres Programme of UNIDO and its transfer of environmentally sound technologies approach promote clean technologies and the preventive approach through demonstration projects to test the local feasibility of innovative technologies and methodologies.

### 3. Capacity-building

88. One of the obstacles in reaching the goal of sound management of chemicals is the widening gap in capacity between developed countries and others. Few non-OECD countries have the required legal, institutional, technical and personnel capacities or adequate laboratory capacities, to analyse chemicals in different media or monitor chemicals in the environment. Accordingly, SAICM stresses capacity-building needs and identifies 29 activities in national capacity-building, including a help desk to provide basic advice and refer requests to relevant agencies, promote chemicals-management instruments, facilitate scientific and technical training of customs personnel and establish national or regional laboratories.

89. Various United Nations agencies provide capacity-building support in this regard. IOMC has produced a range of training materials, including a guide to resource, guidance, and training materials of its participating organizations (www.who.int/iomc/saicm/resource_guide.pdf) and a strategy for strengthening national chemicals management capacities (www.who.int/iomc/publications/strategy_english/pdf).

90. Capacity-building activities under the UNITAR Chemicals and Waste Management Programme include a national chemical management profile (a comprehensive and systematic assessment of a country's infrastructure and capabilities) and SAICM enabling activities/integrated national programmes for chemicals and waste management (see www.unitar.org/cwm/inp) and specialized training in the globally harmonized system and pollutant release and transfer registers.

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[27] UNEP, *Global Environment Outlook-4*, 2007.

# III. Continuing challenges

91. The lack of adequate financial resources, including for the funding of activities concerning the remediation of contaminated sites, is still a major obstacle to achieving the 2020 goal. Countries need to make greater efforts to integrate fully the objectives of sound management of chemicals into national budgets and development cooperation. The link between chemical safety and sustainable development needs to be fully reflected in the funding decisions of bilateral development cooperation agencies.

92. The lack of prioritization of sound management of chemicals, which continues to be perceived principally as an environmental issue without regard to broader implications for sustainable development, is another continuing challenge. Correspondingly, there is a lack of effective "mainstreaming" of sound chemicals management throughout relevant sectors and into development strategies and plans.

93. In many instances, national legislation and policies on chemicals need to be reviewed, updated and strengthened. Where appropriate legislation is in place, there is a need to reinforce coordination mechanisms with international support and training on enforcement and compliance.

94. There is a continuous need for information-sharing, especially on chemical safety and the potential hazardous chemicals in products.

95. The engagement of multiple stakeholders in sound chemicals management needs to be strengthened.

96. It is important to promote synergies to achieve the goals of the national and international chemicals agendas. The coordination and cooperation among existing mechanisms, instruments and processes on chemicals management needs to be enhanced.

97. The implementation of systems for the prevention of major industrial accidents and for emergency preparedness and response needs to be strengthened.

98. Indicators and metrics, possibly with targets and timetables to assess progress on implementation of decisions, need to be developed.

99. Environment and health sector managers need to become more effective partners in the policymaking process by providing timely information and converting technical data into useable forms of information for effective decision-making on chemical safety.

100. There is an urgent need to strengthen cooperative action on emerging policy issues such as nanotechnology, biotechnology, and e-waste.

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## Review of the implementation of Agenda 21 and the Johannesburg Plan of Implementation: waste management

### Report of the Secretary-General

*Summary*

Waste management has evolved from a focus principally on collection and disposal/incineration to a more integrated approach that emphasizes waste minimization, material recycling and energy generation. In a number of countries, waste management is increasingly following an integrated, life-cycle approach. In developing countries, the rapid growth of waste volumes often taxes management capacities and overwhelms infrastructure. Hazardous waste poses particularly complex challenges, especially where it is intermixed with other waste streams.

Priority objectives for waste management include promoting waste prevention and minimization, effective and efficient management of remaining solid and hazardous waste, and focusing on reuse and recycling and on recovery of useful materials and energy. Waste is potentially a valuable resource.

Local authorities, often at the forefront of solid waste management, need institutional capacity-building and the delegation of responsibilities and of financial resources from Governments. Education and public awareness campaigns are important to promoting waste minimization and safe, environmentally sound disposal. Public-private partnerships can also play a role in financing and developing waste infrastructure and management systems.

* E/CN.17/2010/1.

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# I. Introduction

1. The present report reviews progress in the implementation of Agenda 21,[1] the Programme for the Further Implementation of Agenda 21[2] and the Plan of Implementation of the World Summit on Sustainable Development ("Johannesburg Plan of Implementation"),[3] in the thematic area of waste. It takes into account decisions of the Commission on Sustainable Development at its sixth, twelfth, thirteenth and seventeenth sessions. The report was jointly prepared by the Department of Economic and Social Affairs of the United Nations Secretariat and the United Nations Environment Programme (UNEP). It draws on inputs provided by Governments, major groups and the United Nations system, in particular the Basel Convention on the Control of the Trans-boundary Movements of Hazardous Waste and Their Disposal, the International Atomic Energy Agency (IAEA) and the World Health Organization (WHO), and the Organization for Economic Cooperation and Development (OECD).

# II. Review of implementation

2. Effective management of solid waste, hazardous waste and sewage is essential to sustainable development, as mentioned in Agenda 21: "environmentally sound management of wastes was among the environmental issues of major concern in maintaining the quality of the Earth's environment and especially in achieving environmentally sound and sustainable development in all countries" (para. 21.1).

3. Solid waste includes all domestic refuse and non-hazardous waste, such as commercial and institutional waste, street sweepings and construction debris and, in some countries, human waste. Often hazardous waste is intermixed with other waste, which poses particular management challenges. As indicated in Agenda 21, action called for in chapter 21 ("Environmentally sound management of solid wastes and sewage-related issues") is closely related to issues addressed in other chapters, notably those on freshwater, sustainable human settlement development, and protection and promotion of human health.

4. The classification into hazardous and non-hazardous waste is based on the system for the classification and labelling of dangerous substances and preparations, which ensures the application of similar principles over their whole life cycle. Hazardous waste is waste that poses substantial or potential threats to public health or the environment and generally exhibits one or more of these characteristics: carcinogenic, ignitable (i.e., flammable), oxidant, corrosive, toxic, radioactive and explosive.

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[1] *Report of the United Nations Conference on Environment and Development, Rio de Janeiro, 3-14 June 1992*, vol. I, *Resolutions adopted by the conference* (United Nations publication, Sales No. E.93.I.8 and corrigendum), resolution 1, annex II.

[2] General Assembly resolution S-19/2, annex.

[3] *Report of the World Summit on Sustainable Development, Johannesburg, South Africa, 26 August-4 September 2002* (United Nations publication, Sales No. E.03.II.A.1 and corrigendum), chap. I, resolution 1, annex.

# A. Assessment of current situation of waste management

## 1. Trends in production and consumption patterns and their impact on waste generation

### (a) Progress towards sustainable production and consumption patterns

5. Population growth and economic development are the principal drivers of resource consumption as well as waste generation, and even if in principle they need not be perfectly correlated, in practice only a handful of countries have begun to achieve meaningful "decoupling" between income, consumption, material throughput, and waste production. Where it has happened, decoupling has been made possible by improvements in resource efficiency, structural change (including export of resource intensive industries) and increased rates of material recycling.

6. Although decoupling has yet to bring about a reversal in the seemingly inexorable rise of material throughput and waste volumes, there is evidence of a link between incomes and the willingness of societies to spend on environmental improvements, for example, through improved waste management systems. It is reflected in the emergence in many countries of an environmentally conscious consumer public, as well as the increased interest by businesses to promote environmentally sound consumer products.

### (b) Impact on waste generation

7. Global data on waste generation are notoriously variable in quality. This is because of the lack of reporting by many countries, inconsistencies in reporting methods, and differences in definitions and surveying methods employed by countries.[4] The information presented below should therefore be used with caution.

8. The data reported here refer to the "collection phase", that is, the time when waste enters the economic stream. While relatively reliable data are available on municipal waste (though only for urban populations in emerging and developing countries), data on industrial wastes (both hazardous and non-hazardous) tend to be less comprehensive and consistent, even in developed countries.

9. The "Global Waste Management Market Assessment 2007"[5] estimates the global volume of municipal solid waste in 2006 to be 2 billion tons, projected to increase by approximately 8 per cent per year until 2011. There is a wide range between regions, both in per capita and aggregate terms. Table 1 provides an indication of the divergence between regions in terms of municipal solid waste generated in 2004.

[4] Elisabeth Lacoste and Philippe Chalmin, *From Waste to Resource: An Abstract of the 2006 World Waste Survey* (Paris, Economica Editions, 2006).

[5] A Key Note Market Report (United Kingdom, Key Note Publications, 2007).

Table 1
**The collection of municipal waste worldwide: an attempted estimate for 2004 (in millions of metric tons)**

| | |
|---|---|
| OECD countries | 620[a] |
| Commonwealth of Independent States (Baltic States excluded) | 65[b] |
| Asia (except OECD) | 300[c] |
| Central America | 30[d] |
| South America | 86[e] |
| North Africa and Middle East | 50[f] |
| Sub-Saharan Africa | 53[g] |
| **Total** | **1 204** |

*Source*: E. Lacoste and P. Chalmin, *2006 World Waste Survey: From Waste to Resource* (Paris, Economica Editions, 2006).

*Note*: Extrapolations are calculated based on ratios concerning the GDP/inhabitant, the consumption of paper and paper-based products/inhabitant, the rate of urbanization and the total population. For emerging and developing countries, only the amount of urban waste was estimated.

[a] Statistics gathered.
[b] Extrapolation from data from 10 new European Union member countries.
[c] Statistics gathered and extrapolated for Viet Nam, Indonesia and Bangladesh.
[d] Extrapolation from Mexican data.
[e] Extrapolation from Brazilian and Argentinean data.
[f] Extrapolation from Egyptian data.
[g] Extrapolation from Kenyan data.

10. Finally, as mentioned, waste generation is strongly correlated with gross domestic product, and while there are exceptions the overall relationship is almost linear, showing little evidence of decoupling at higher income levels.

11. Although developed countries have recently succeeded in reducing the environmental impact of solid waste through such measures as sanitary landfills, high-temperature incineration, increased recycling, and use of waste for electricity generation, the aggregate waste volume is still either growing or has stabilized at very high levels.[6] In Europe, for example, municipal waste per capita has stabilized since 2000 but at an overall level for the European Union countries plus the countries of the European Free Trade Association of around 500 kilograms (kg) per capita.[7] The intensification of economic activities outweighs the effects of waste prevention and recycling initiatives.

12. Packing waste remains a major problem in the European Union member States. There has been a general increase over the past decade in per capita quantities of packaging being put on the market in both old and in the new member States. This is in spite of the fact that the European Union target of recycling 25 per cent of packaging waste in 2001 was exceeded, as was the 2006 target of 55 per cent.[8]

[6] United Nations Environment Programme, "Integrated Waste and Resource Management," 2007.
[7] See Department of Economic and Social Affairs Trends report 2010-11: chemicals, waste, transport and mining, New York.
[8] European Environment Agency, "Generation and recycling of packaging waste", assessment published in January 2008.

13. There has been a rapid increase in the overall waste volumes generated in developing countries over the past few decades and, in rapidly industrializing countries, rapid growth in industrial and hazardous waste as well. Rising incomes have enabled waste management infrastructure to expand in some cases, whereas in others growth in waste volumes has outstripped the expansion of management capacity.

14. For Latin America and the Caribbean, several World Bank studies project that municipal solid waste will increase from 131 million tons in 2005 to roughly 179 million in 2030.[9]

15. In Africa, while per capita waste generation remains very low in comparison with the world and OECD averages, the total volume is growing because of the high rate of population growth and urbanization. The total annual waste volume is estimated at around 200 million tons, of which anywhere from 30 to 50 per cent is not disposed properly.

16. Asia is also similar in that urbanization and economic growth are the main reasons for high levels of waste generation. In general, the per capita generation of solid waste is similar to the rates in many African cities.

17. As mentioned, data on industrial waste are highly unreliable, especially for hazardous waste (mainly because of conflicting definitions). Consistent data are available for the European Union, the United States of America, Canada, Japan, the Republic of Korea and Australia, but not for the Russian Federation or China. For China, for example, OECD estimates industrial waste to be 315 million tons in 2002, while a Chinese official study gives a figure of about 1 billion tons.

18. E-waste (also referred to as waste electrical and electronic equipment (WEEE)) is an emerging waste stream classified as hazardous (because of the presence of heavy metals and toxic chemicals). Estimates range from 7 to 13 kg per capita per year, which is equivalent to between 2.5 and 5 per cent of total global municipal waste. There are over a billion personal computers in the world; those in developed countries have an average life of just two years. In Europe e-waste is increasing by 3 to 5 per cent per year — almost three times faster than the total waste flow. Large quantities of e-waste find their way to developing countries.

19. Construction and demolition is, in respect of weight, another large waste stream in urban areas. In developed countries construction waste could be 10 to 15 per cent of total waste.

20. Mining waste takes up a great deal of space, blights the landscape and often affects local habitats.[10] By its very nature it can constitute a serious safety hazard. The European Environment Agency estimates that its member countries generate 400 million tons of mining waste every year, accounting for 29 per cent of total waste generated. Global estimates of material removed in the mining of iron, copper and gold alone range up to 33 billion tons per year, which dwarfs the 2 billion tons of municipal solid waste in comparison.

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[9] Public-Private Infrastructure Advisory Facility, "Managing Municipal Solid Waste in Latin America and the Caribbean", *Gridlines*, Note No. 29 (October 2007).

[10] For more detailed analysis of mining waste issues, see E/CN.17/2010/7.

### (c) Economic, environmental, health and social impacts of current practices of waste management

21. Waste generation is connected with potential environmental, health and social problems. However, managing waste is costly. OECD countries spend about $120 billion a year disposing of their municipal waste alone and another $150 billion on industrial waste.

22. Costs occur along the entire waste supply chain, from collection through landfill disposal, incineration or recycling. Waste collection costs need to be covered to make the service financially sustainable. This may be done from tax revenue, for example, through a surcharge on property taxes. Collection fees are a widely used instrument, which may in some cases be added to water or electric utility bills.

23. Developing countries face challenges to properly manage waste. Most efforts are being made to reduce final volumes and generate sufficient funds for waste management. It is common for municipalities to spend 20 to 50 per cent of their recurring budget on solid waste management — even though only 40 to 60 per cent of urban waste is collected and less than 50 per cent of urban population is served. In middle income countries, collection costs 50 to 80 per cent of the solid waste management budget. In high income countries, with larger budgets and upfront community participation in recycling and recovery, collection accounts for less than 10 per cent of the budget, which allows large funds to be allocated to waste treatment facilities.[11]

24. In low income countries, almost the entire budget (80-90 per cent) of municipal solid waste management is allocated to collection. In general, in the developing world, few cities have adequate solid waste collection and disposal systems, and the accumulating waste threatens health, damages the environment, and detracts from the quality of life.

25. In 2002, a World Health Organization (WHO) assessment in 22 developing countries showed that between 18 and 64 per cent of health-care facilities did not use proper waste disposal methods. Worldwide, 8 to 16 million cases of hepatitis B, 2.3 to 4.7 million hepatitis C, and 80,000 to 160,000 HIV infections occur yearly because of reused unsterilized syringes and needles. Additional health hazards occur from scavenging on waste disposal sites and from manual sorting of the waste at health-care facilities.

### 2. National and local procedures for assessing waste quantity

26. Waste definitions vary from country to country and the reporting mechanisms as well as the reliability of reported data also vary. In the absence of scientific data collection mechanisms, quite often data are reported on an "estimation" basis. Such data should be taken merely as indicative of trends. Relatively reliable data on waste is available mainly from OECD countries. In developing countries, waste quantity is generally assessed based on per capita waste generation factors, sometimes supported with basic studies. Generally, the assessment of hazardous waste, particularly industrial hazardous waste, is better owing to reporting requirements for

[11] United Nations Environment Programme, "Developing integrated solid waste management plan, Training manual", vol. 1, "Waste characterization and quantification, with projections for future", 2009.

the Basel Convention. The data on waste streams such as waste agricultural biomass, construction and demolition waste is generally the weakest.

## 3. Current monitoring methodologies

27. For effective monitoring of waste generation, it is important to establish waste treatment and disposal quality criteria based on the assimilative capacity of the receiving environment, to undertake waste-related pollution impact monitoring and conduct regular surveillance.

28. In most developed countries, waste monitoring is conducted through waste characterization studies (to analyse waste streams), customers' surveys usually carried out over a five-year period, and market analyses of targeted materials conducted to assess current and future markets for recyclable materials.

29. Few developing countries have an effective regulatory framework or the infrastructure to monitor waste properly. Communities handling and processing waste are unaware of the dangers owing to the lack of a system to warn retailers and users about hazards.[12]

Box 1
**Waste monitoring in Romania**

Romania is an example of an emerging country with successful waste monitoring. Measures have been taken at all levels — legislative, organizational, institutional, and financial — and a network of specialized monitoring stations has been set up to follow up on environmental quality. Romania is committed to fulfilling the agreements of the international conventions on the environment.

In Romania, all waste monitoring initiatives are organized at the national level. A supervisory network for the monitoring of environmental quality and collection of data on pollutant emissions and transfers as well for storage and processing of such data is set up to make waste monitoring successful. The network has proven to be efficient and has identified 25 localities in the country as hot spots.

Source: World Bank, "Observations of solid waste landfills in developing countries", 2009.

30. Most regions in the world are suffering from poor waste monitoring mechanisms. Some countries lack resources and financial assistance while others need stricter regulations and enforcement to monitor trends in waste generation.[13]

31. African cities need financial assistance and the infrastructure to construct transfer stations for waste and hire more waste collectors.[14] Today, the region

[12] United Nations Environment Programme, "533 tools and methodologies for monitoring and controlling chemicals and waste", 2009.

[13] O. Kofie and A. Bradford, "Organic Waste Reuse for Urban Agriculture", International Development Research Centre.

[14] World Bank, "Observations of solid waste landfills in developing countries", 2009.

receives the lowest level of investment of World Bank funds in waste monitoring technology, such as specimen banking. Greater investment in such technology would help establish retrospective baseline data and provide a tool for assessment and management of long-term environmental trends.[14]

32. In Asian countries, such as China and India, national and regional authorities record and inspect incoming waste but rarely monitor the environmental effects of waste disposal. In some cases, this has led to relaxed application of environmental mitigation measures and greater tolerance of open fires on a landfill.

33. Central Asian countries, such as Uzbekistan and Kazakhstan, struggle to meet governmental waste monitoring demands. Some important waste streams are not properly monitored. Inventories of high potential hazardous waste are lacking in several countries, while data quality is often uncertain. Data collected are often incomplete and little work has been done to analyse or synthesize data for policy development and assessment.[14]

34. Latin America and Caribbean countries also have weak and outdated waste monitoring, and waste management plans are often inadequate. While the sheer volume of waste does not constitute the problem, the inability of Governments and waste-disposal firms to keep up with waste is the core issue.

## B. National and local polices and strategies for waste management

### 1. National and local policies

35. Although the concept of waste prevention is broadly accepted, it is apparent that ever-growing waste amounts, waste diversity, and associated risks are heightening the need for Governments to pursue waste prevention measures more vigorously. The 3Rs (reduce, reuse, and recycle) concept has yet to be widely implemented, with the focus of many existing waste management policies and programmes continuing to be on collecting and disposing of waste once it has been generated.

36. Around the globe, countries have developed national policies and strategies. In developing countries, although many Governments have formulated waste management policies and strategies, implementation and enforcement are often weak apart from selected urban centres. In many developing countries, informal waste collection and recycling dominate owing to gaps in public funding and policy.

37. Some specific examples of national policies are described below. In many countries, there are trends towards decentralization of environmental responsibilities from national to subnational authorities, increasing public participation and public-private partnerships.

38. Canada has developed a Competitiveness and Environmental Sustainability Framework to realize economic and environmental integration. The framework will address, among other items, 3Rs issues. To oversee this policy framework, the Prime Minister has established a cabinet subcommittee for environment and sustainable development. Most implementation of the 3Rs has been at the subnational level in Canada.

39. In Germany, the 3Rs policy has stabilized waste volumes over the last 15 years, and has increased recycling rates through sound waste treatment. Now the

Government is aiming towards the development of a closed-loop circular economy with maximum waste reduction, recycling and reuse. Germany aims to end landfilling by 2020.[15]

40. In South Africa, the Government adopted a national waste management strategy in 1999 and introduced regulations restricting the use of plastic bags, banning the use of asbestos where possible, and eliminating mercury dumping. Civil society has also contributed to the effort, for example, through training services.[16]

41. In Brazil, the proposed National Solid Waste Policy Law incorporates the principles of the 3Rs. The Government is promoting separated garbage collection in municipalities. Successful private sector initiatives include aluminium can recycling, with a success rate above 95 per cent. Local garbage pickers perform an essential and increasing role, and have formed organizations with aid from NGOs.

42. In 2004, Mexico passed the General Law for the Prevention and Integral Management of Wastes promoting the 3Rs policies. Voluntary programmes are also carried out to promote clean industry policies in the tourism sector and the beer industry, among others. Some 30,000 firms in the private sector have also registered in a voluntary census on hazardous waste. Currently, 95 per cent of glass and 75 per cent of paper is being recycled. Methane gas emitted from landfills is also being used as a low-cost energy source.

43. The Republic of Korea has enacted legislation to promote the recycling of construction waste and the purchasing of eco-friendly products. A volume-based waste fee system was introduced in 1995. Proper sorting and collection of waste is administered by collection services for recyclable products at no cost, resulting in a 23 per cent reduction of per capita waste generation over the past 10 years.

44. In China, the Government is seeking to establish a circular economy, through a legislative framework and experimentation at the local level. The circular economy policy is incorporated in China's eleventh five-year national development plan.[15]

45. Japan has adopted laws that constitute the country's system of legal and voluntary initiatives as part of the system-wide policy development effort. The most important of these was the Fundamental Law for Establishing a Sound Material-Cycle Society, which established the basic principles for the creation of a recycle-oriented society.[17] Japan aims to realize a zero-waste society in Japan based on the quantitative targets and further 3R actions, and to disseminate its experience to the international community.

46. In the Philippines, the Ecological Solid Waste Management Act, and the Toxic Substances and Hazardous and Nuclear Waste Control Act have institutionalized waste recycling and composting, and prescribed the management, treatment and disposal of toxic and hazardous waste. There are efforts to promote segregation at source through capacity-building in municipalities and financing 3Rs education programmes, and to move towards sanitary landfills.

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[15] Information submitted to the Ministerial Conference on the 3R Initiative, held in Tokyo, from 28-30 April 2005.

[16] http://www.iwmsa.co.za/index.php?option=com_frontpage&Itemid=1.

[17] Asian Development Bank, *Towards Resource-Efficient Economics in Asia and the Pacific: Reduce, Reuse, Recycle*, 2008.

47. The Government has developed a national integrated waste management plan. It has also taken measures to prevent the export of waste to Thailand. Many 3Rs projects are being implemented, including Government green procurement, a waste exchange programme with over 400 industries currently registered, and tax incentives to encourage the recycling of lead-acid batteries.

48. In 2006, the Government of India enunciated a waste reduction and minimization strategy through its National Environment Policy, which envisaged strengthening the capacities of local bodies for segregation, recycling and reuse of municipal solid waste. The policy provides legal recognition for and strengthens the informal systems of collection and recycling of various materials. Policies and regulations have also been formulated for the management of municipal solid waste, medical waste and hazardous waste.

49. In Australia, provisions encouraging waste recycling and reuse are contained in laws governing hazardous wastes and renewable energy as well as environment protection. For the problem of e-waste, the Government has implemented stricter regulations on take-back schemes, superseding industry-based voluntary recycling schemes.[18]

### 2. Regulations and economic incentives

50. In general, no individual waste prevention tool is likely to promote an absolute reduction in waste without the aid of complementary tools and approaches. Depending on the context, public awareness campaigns, regulatory instruments, and economic instruments need to be used in combination. Economic instruments, such as resource taxes and household user fees combined with landfill taxes, have been particularly useful for inducing overarching waste prevention behaviour. Many developed countries such as Denmark impose laws requiring all waste producers to pay a tax on the incineration and landfilling of waste.

51. Other countries and states have incorporated similar initiatives. For example in Italy, a landfill tax is promoting 3R waste policies, making economically attractive a reduction in biodegradable waste sent to landfills. Eco-prizes are awarded for environmentally friendly packaging and for using recycled raw materials. Over 30 per cent of products used by State-owned firms and governmental agencies must be made from recycled materials.[15]

52. In the United States, Washington State Law requires that all businesses that generate any amount of hazardous waste pay a "hazardous waste generation fee". Funds collected are used to support waste reduction activities such as educational workshops.[19]

### 3. Private sector initiatives and experiences

53. While many industrialized countries have successfully mobilized the private sector in the environmentally sound management, reuse and recycling of waste,

[18] Spire Research and Consulting Ltd, "Recycling for the Next Generation: How impending recycling legalisation will change the way businesses work", 2006.

[19] Washington State Department of Ecology.

some examples of such mobilization have also emerged in developing countries. By and large, the private sector's role is much less prominent in these countries.[20]

54. In the Philippines, for instance, local government units, NGOs and private corporations have initiated recycling activities.

55. Eastern European countries are facing difficulties in financing the centrally controlled model of solid waste management service delivery and are turning increasingly to the private sector for services, including collection and disposal. In some cities, residents are paying fees directly to private collectors.[21]

56. In Latin America, private collection firms have the exclusive right to service specific areas in many cities and contracts are awarded by competitive bidding. Local authorities still need to establish operational and environmental regulations and standards to guide private contractors and oversee their activities.

57. In South Africa, the waste management sector is dominated by the private sector with selective operations in the recycling of saleable products.[22]

## C. International and regional initiatives for waste management

58. Some regional mechanisms and international instruments already exist mainly in capacity-building. Below are few examples of international and regional initiatives.

### 1. Marrakech Process

59. The Marrakech Process is a global process led by the Department of Economic and Social Affairs (and the United Nations Environment Programme (UNEP) with active participation of national Governments, development agencies, and civil society. Its goals are: to support the elaboration of a 10-year framework of programmes on sustainable consumption and production in order to assist countries in their efforts to green their economies, help corporations develop greener business models, and encourage consumers to adopt more sustainable lifestyles. Waste management has been identified as a regional priority in a number of regional meetings held under the auspices of the Marrakech Process, and a programme of support to integrated waste management at national and local levels will most likely be included in a 10-year framework of programmes (see E/CN.17/2010/8).

### 2. Basel Convention

60. The implementation of the Basel Convention provides evidence that transboundary movements of hazardous waste cannot be meaningfully addressed in isolation from the entire set of waste issues. The hazardous waste issues dealt with under the Convention overlap with and are in many ways inseparable from the issues surrounding municipal and other waste.

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[20] *Solid Waste Management and Recycling: Actors, Partnerships and Policies in Hyderabad, India, and Nairobi, Kenya*, I. Baud and others (eds), Dordrecht, GeoLibraries Series No. 76, Kluwer Academic Publishers, 2004.

[21] United Nations Environment Programme, "International source book on environmentally sound technologies for municipal solid waste management", 2009.

[22] Toma V. Golush, (ed.) "Waste Management Research Trends" (New York, Nova Science Publishers, 2008).

61. One important emerging issue under the Basel Convention is end-of-life electronics products. By one estimate, 230,000 computers are scrapped in the United States each day, and 90 per cent of those are not recycled domestically.[23] Large quantities of e-waste are being exported to developing countries for reuse, repair, refurbishment, recycling and recovery of non-ferrous and precious metals at facilities that do not always operate under sound environmental conditions. Recognizing the importance and global dimension of the e-waste problem, the Conference of the Parties to the Basel Convention, held in December 2006, adopted the Nairobi Declaration on the Environmentally Sound Management of Electrical and Electronic Waste. Subsequently, at its ninth meeting, held in Bali in June 2009, a global workplan was adopted by the Conference of the Parties. The e-waste workplan includes, for example, a global partnership on computing equipment and the development of technical guidelines on the environmentally sound management of e-waste.

### 3. Regional initiatives

62. The OECD Environmental Strategy, adopted by the Environment Ministers in May 2001, outlined the need for such integrated solutions as sustainable materials management, and led to recommendations adopted by the OECD Council in April 2004.

63. On 21 December 2005, the European Commission proposed a new long-term strategy that aims to make Europe a recycling society, which seeks to avoid waste and uses waste as a resource, in part by introducing a life-cycle approach to waste policy.

64. The Government of Japan has put forward the 3Rs (reduce, reuse, and recycling) Initiative for the endorsement of the leaders of the Group of Eight countries at the 2008 summit in Hokkaido, Japan. It is now working to disseminate it at the regional level. The Initiative has a strong focus on waste prevention and minimization.

## D. Environmentally sound waste reuse and recycling

### 1. Assessment of current levels of waste reuse and recycling

65. Recycling and reuse of waste follows several routes. In developing countries, often materials are segregated from waste and recycled for secondary uses. This includes paper, bottles, textiles, and the like. Discarded products (especially WEEE) are refurbished and sold off as second-hand products. Some waste (such as construction and demolition debris, organic waste converted into compost), with little or no processing, are reused for other purposes. Quite often waste is incinerated to meet thermal energy needs, for example, for cooking in rural areas.

66. The extent of recovery and recycling depends on such factors as the market for recycled materials, price of recycled material vis-à-vis virgin materials, local economic conditions, and so on. The estimated size of the main world secondary material market is given in table 2.

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[23] Alan Hershkowitz, Natural Resources Defence Council presentation at a seminar on "Waste management", held at United Nations Headquarters, 12 January 2010.

Table 2
**Estimated size of main world secondary material markets, 2004**
(Millions of tons)

| |
|---|
| Recovered fibres (paper): 170 |
| Recovered ferrous metals (scrap metal): 405 |
| Recovered on-ferrous metals: 24 |
| Recovered plastics: 5 |
| **Total: Approximately 600** |

*Source*: E. Lacoste, P. Chalmin, *2006 World Waste Survey: From Waste to Resource* (Paris, Economica Editions, 2006).

67. The estimated amount of materials collected from municipal waste in Europe and the United States is given in table 3.

Table 3
**Recovery of materials from municipal waste in Europe and the United States**
(Thousands of tons)

| | *Germany* | *France* | *United Kingdom* | *Italy* | *Spain* | *Total Europe* | *United States* |
|---|---|---|---|---|---|---|---|
| Paper and cardboard[a] | 8 500 | 5 200 | 3 700 | 2 000 | 3 500 | 32 700 | 40 000 |
| Plastics | 3 850 | 350 | 450 | 350 | 310 | 6 500 | 1 930 |
| Glass | 3 300 | 2 000 | 1 500 | 1 000 | 510 | 10 000 | 2 350 |
| Non-ferrous metals | 1 204 | 1 750 | 75 | 278 | 121 | 3 975 | 1 750 |
| **Total** | **16 854** | **9 300** | **5 725** | **3 628** | **4 441** | **53 175** | **46 030** |
| Batteries | 11.5 | 9.6 | — | — | — | 28 | — |
| End-of-life vehicles — ferrous metals | | | | | | 11 000 | 17 000 |

*Source*: E. Lacoste, P. Chalmin, *2006 World Waste Survey: From Waste to Resource* (Paris, Economica Editions, 2006).

[a] Recovered from municipal and industrial waste.

68. Recycling in developing countries is mainly through the unorganized sector: an informal network of rag-pickers (both from primary disposal points as well as intermediate/final disposal areas), door-to-door collectors, primary and secondary dealers and, finally, recycling industries. There are no official estimates of the extent of such recycling. Informal recycling is a source of livelihood for many mostly poor people in developing countries. It is estimated that the recycling for high-value items — for example, metal, clean paper and plastic, and so on — is relatively high as compared to that of organic constituents (except for isolated examples such as Bangladesh where organic waste recovery is widespread).

69. The European region is making substantial progress in incorporating sounder waste methods. For example, recycling has greatly reduced waste generation in the United Kingdom. Increases in recycling since 2000 have more than offset increases in waste generation, reducing the volume of municipal waste for disposal by 15 per cent.

A landfill tax has also provided an incentive for both waste reduction and recycling. Furthermore, the European Union, where consumer interest and governmental involvement are high, is implementing new recycling-related legislation.[22]

70. Household recycling has expanded dramatically in many OECD countries. In the United States, some 9,000 municipalities have introduced public collection of separated household waste for recycling since the 1970s, with some achieving municipal waste recovery rates of 50 per cent.[21]

71. In some villages in Fiji, an Environment Committee has been formed and has implemented the policy on reuse, recycling and composting of organic matter as well as collection and disposal of residual solid waste[21].

72. Latin America has wide variations in the practice of recycling across countries, owing largely to the systems of rewards and punishments that are in place. According to the Brazilian Aluminum Association, about 80 per cent of the 9.5 billion aluminium cans sold in 2000 were recycled. This would put Brazil right among the ranks of world's recycling leaders such as Japan. Whereas Japan's system is based upon responsible citizenship, Brazil uses economic incentives. In the major metropolitan areas, there are many recycling centres that buy back recyclable materials for cash or discount foods.[24]

73. While Africa has the least resources for implementing more advanced waste methods, it is making a strong push towards achieving environmental standards. For example, the United Republic of Tanzania has been aggressive in the fight against heavy use of plastic bags. In 2006, Vice-President Ali Mohamed Shein declared a total ban on plastic bags. Kenya and Uganda are implementing less severe restrictions, imposing levies on thicker plastic bags.[25]

74. Communities in many developing countries are starting to carry out significant waste reduction practices. In designing strategies for further waste reduction, however, the first principle should be to build on what exists and appears to be working. This entails an understanding and assessment of local practices in waste reduction, waste recovery, and recycling.

### 2. Environmentally sound waste treatment and disposal

#### (a) Assessment of technologies for waste treatment and disposal

75. There is a consensus among environmentalists that zero waste can only be achieved with the complete adoption of cleaner technology. Reducing to zero-waste levels would entail the continuous application of an integrated preventative environmental strategy applied to processes, products, and services to increase overall efficiency and reduce risks to humans and the environment.[26] A number of cities around the world have adopted zero waste as a goal, including Los Angeles in the United States and several cities in Italy.[27] One of the goals of the Los Angeles zero-waste plan is to divert 70 per cent of trash from landfills by 2015.

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[24] Zona Latina, "Recycling in Latin America", 2002.

[25] "Trends from around the world", reusablebags.com, 2009.

[26] United Nations Environment Programme, "Introduction to Cleaner Production (CP) concepts and practice".

[27] Presentation by Paul Connett, St. Lawrence University, a seminar on "Waste management", held at United Nations Headquarters, on 12 January 2010.

Box 2
**World Bank waste collection and disposal statistics**

The World Bank evaluation on collection and disposal of waste: urban waste collection and disposal (percentage of waste tonnes handled):

- Developed countries — High income

  Collection — 100 per cent

  Safe disposal — 100 per cent

- Developing countries — Middle income

  Collection — 60 per cent

  Safe disposal — 30 per cent

- Developing countries — Low income

  Collection — 40 per cent

  Safe disposal — 5 per cent

*Source*: Estimates of S. Cointreau, 2007.

*(i) Landfills*

76. Europe still relies mostly on landfills technology as the primary disposal technology for solid waste generated in the region, with Greece leading the region followed by Ireland and the United Kingdom. Denmark leads the group relying primarily on incineration as a waste treatment technology. Composting and recycling are very much lagging behind incineration and landfills, while plasma and syngas are still under consideration.[28]

77. In some countries such as the United Kingdom where the geology lends itself to landfills, it is more cost effective to landfill waste than to incinerate. In other parts of the world such as in Austria, Belgium, Germany, Japan, the Netherlands, and the Scandinavian countries, more waste is recycled or incinerated.

78. In Asia, incineration and landfills are still the most widely used solid waste treatment and disposal technologies in most cities.[29]

79. A properly designed and well-managed landfill can be a hygienic and relatively inexpensive method of disposing of waste materials. Older, poorly designed or poorly managed landfills can create a number of adverse environmental impacts such as windblown litter, attraction of vermin, and generation of liquid leachate.

80. Many landfills in developing countries are dumps on open plots, wetlands and lands with water near the surface. At the same time, many developing countries have sanitary landfills and others are in the process of upgrading landfills to sanitary

[28] "OECD, Eurostat, Landfilling and Incineration still leading Europe, 2002 and 2001", published in UNEP/GRID Arendal, *Vital Waste Graphics*, 2004.

[29] Environmental Protection Department, Hong Kong, China, "Waste Disposal", 2006.

ones, including South Africa, Uganda, Ghana and Egypt. A number of developing countries have had tipping fees for landfills in place for many years.

81. One critical issue is that hazardous waste is sometimes disposed of along with non-hazardous solid waste, which is collected and deposited in municipal landfills and open dumps.

*(ii) Incineration*

82. Incinerators are costly and used mostly in developed countries (see table 4). Additionally, the high organic and water content of the waste stream makes incinerators energy consumers rather than energy producers. Incineration in Nigeria and the United Republic of Tanzania has proven unsustainable. A few cities, however, such as Yaoundé and Bamenda in Cameroon, use incineration on a small scale for hazardous waste such as hospital waste.[30]

Table 4
**Incineration as share of municipal waste**

| *Country* | *Percentage* |
|---|---|
| Japan | 74 |
| Denmark | 58 |
| Switzerland | 47 |
| Netherlands | 42 |
| United Kingdom | 9 |

*Source*: The Open University, "Working with our environment: technology for a sustainable future", 2005; Eurostat.

83. In 1990, the United States Environmental Protection Agency estimated that, by the year 2000, the United States would be incinerating 26 per cent of its solid waste, but by 1992, the Agency had lowered that estimate to 21 per cent. Today, even that reduced estimate seems overly optimistic.[31]

84. Views differ markedly on the desirability of incineration versus other waste treatment options. Historically, toxic emissions (dioxins and furans) were a major health concern but improved emission control designs have lessened this concern. Fine particle and heavy metal emissions remain a cause of concern, as does the safe disposal of toxic fly ash.

*(iii) Composting*

85. Controlled composting, which is converting waste into fertilizer for the soil, is the safest way to produce high quality products for soil amendment.[32] While expensive, composting can have many environmental advantages such as enriching soil, cleaning up contaminated soil, avoiding pollution, and offering economic benefits by lessening the demand for water, fertilizers, and pesticides.[32]

[30] Eric Achankeng, "Globalization, urbanization and municipal solid waste in Africa", University of Adelaide, Australia, 2003.

[31] United States Environmental Protection Agency, "Incineration technology", 2001.

[32] World Bank, project guidance material, www.worldbank.org/solidwaste, 2007.

86. Owing to its high costs, compost is a technique used on a large scale mostly by developed countries, even though most developing countries have a high percentage (50-80 per cent) of organic matter with high moisture content in their waste stream. In the European region, a number of composting facilities exist and different composting systems are being applied. Overall, there is a tendency to establish larger plants. In principal, European composting facilities run successfully, but the potential for improvement still exists.[32]

87. In Africa, composting at industrial scale was tried in Dakar and Abidjan but soon failed owing to the lack of demand for the final product.[30]

88. International non-governmental organizations (NGOs) have sponsored small scale composting in Benin, Cameroon, Egypt, Kenya, Nigeria, South Africa, and Zambia, but the practice has not had significant impact on cities' reduction of municipal solid waste. Poor quality of the manure resulting from inadequate segregation of waste appears to have contributed to the low demand.

89. India, Pakistan and Sri Lanka have adopted decentralized composting schemes. In India, many small-scale composting initiatives, often receiving international assistance, were initiated by NGOs or community groups, particularly in the 1990s.[33] In Sri Lanka, several composting activities were initiated by the Government, people's organizations, academic institutions, and private companies, but met little success, either because of the marginal quality of the product or the lack of viable markets.[33]

90. Among successful, community-based examples can be cited the decentralized composting scheme in Mirpur community in Dhaka. Today, the plant operates at full capacity, processing around three tons of raw waste per day.

91. The experience with composting in developing countries suggests the need in future for ensuring higher and more consistent quality of compost, including through better waste segregation, as well as effective marketing to ensure adequate demand.

*(iv) Recovery of energy from waste*

92. Recovery of energy from waste describes the process of creating energy in the form of electricity or heat from the incineration of a waste source. Most waste-to-energy processes produce electricity directly through combustion or produce a combustible fuel, such as methane, methanol, ethanol or synthetic fuels. Although incineration of municipal waste coupled with energy recovery can form part of an integrated waste management system, strict controls are required to prevent negative impacts on human health and environment.[33]

93. Waste-to-energy has thrived in Europe and Asia. Today, the European Union considers waste-to-energy as the preferred method of waste disposal.[34] European countries with the highest proportions of municipal waste thermally treated for energy generation are: Luxembourg, Sweden, Denmark, France, Belgium, the Netherlands and Germany. Waste-to-energy facilities in Europe can provide 20 million inhabitants with electricity and 32 million with heat.[34]

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[33] The Chartered Institution of Water and Environment Management, "Energy recovery from waste", 2009.

[34] Alternative Energy, "Waste as a renewable energy source", September 2008.

94. It would be, however, incorrect to assume that all countries in Europe are excelling in energy recovery from wastes. Only 10 per cent of municipal waste in the United Kingdom is currently managed through energy recovery. Energy from waste has the potential to replace up to one third of the coal used to generate electricity in the United Kingdom and easily satisfy the 2010 target of 10 per cent of electricity generated from renewable sources.[33]

*(v) Gasification*

95. The term describes a chemical process by which carbonaceous (hydrocarbon) materials (coal, petroleum coke, biomass, etc.) are converted to a synthesis gas (syngas) by means of partial oxidation with air, oxygen, and/or steam.[35] Syngas is most often produced from coal, but also from biomass or municipal waste.

96. In a 2004 survey, the Gasification Technologies Council identified 385 gasifiers in use at some 177 projects in 27 nations. Major projects are operating successfully.[35]

97. The world's largest concentration of gasifiers is in South Africa where synthetic fuels and chemicals have been produced from coal since 1955. The gasification projects at Sasol and Secunda use some 100 gasifiers to produce more than 40 per cent of South Africa's liquid fuels and a variety of chemical products.[35]

98. In Asia, gasification plants are operating in China, India and Japan. Five large integrated gasification combined cycle projects operate in Western Europe, with the greatest concentration in Italy. The three Italian projects produce more than 1,500 megawatts electrical of electricity from refinery residuals.

99. In North America, gasification is used to produce chemicals, fertilizers, and electricity at several sites across the United States. Major projects include a coal-to-chemicals facility in Kingsport, Tennessee, and a coal-to-methane (natural gas) project in North Dakota.

## E. Radioactive waste

100. Developing countries often find it too difficult to afford nuclear power plants and other facilities that produce radioactive waste. With some notable exceptions, developed countries are the main producers of radioactive waste.

101. The global inventory of radioactive waste managed today amounts to circa 7 million cubic metres of low- and intermediate-level waste, 200,000 tons (heavy metal) of spent nuclear fuel, 800,000 cubic metres of high-level waste and 2 billion cubic metres of residues coming from the uranium production cycle. This waste is managed in a variety of storage and disposal facilities. Storage and disposal of low-level radioactive waste is a well-established practice worldwide. Storage of spent nuclear fuel and high-level waste is also a well-established practice. Disposal of spent nuclear fuel and high-level waste, while at a mature stage of conceptual development, remains to be implemented.

102. There are two types of radioactive waste. High-level radioactive waste results primarily from the fuel used by reactors to produce electricity while low-level

[35] Clean-energy, US, http://www.clean-energy.us/facts/gasification.htm, 2009.

radioactive waste results from reactor operations and from medical, academic, industrial, and other commercial uses. Globally, approximately 4 million cubic feet and 530,000 curies of low-level radioactive waste were disposed of in 2005. Although the relative amount of high-level radioactive waste is negligible with respect to the total volume of radioactive waste produced in nuclear power programmes, it contains 99 per cent of the radioactivity in this volume. Thus, high-level waste needs to be handled carefully.[36]

103. Disposal facilities for spent nuclear fuel or high-level waste from reprocessing have so far not yet been implemented. However, quantities of high-level radioactive waste arising are small and can be stored safely for extended periods of time. As of 2008, about 170,000 tons were in storage in OECD countries (which have 83 per cent of the worldwide installed nuclear capacity).

104. To manage radioactive waste, the international community follows the global nuclear safety regime, including:

- Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management
- International safety standards
- National legal and regulatory framework
- IAEA regulatory review services.

105. Radioactive waste of all kinds needs to be managed responsibly to ensure public safety and protection of the environment, as well as security from malicious intervention, now and in the future. The most challenging task involves management of the long-lived waste that must be isolated from the human environment for thousands of years. The most common option for eventual disposal is emplacement in repositories deep underground in well-chosen geologic media.[36]

106. The available literature suggests that while geological disposal of spent nuclear fuel and high-level radioactive waste is technically feasible, the search for and selection of disposal sites has proven to be politically and socially challenging. Recent experience shows the benefit of open and transparent processes that allow sufficient time and include a concerted effort to assure that there is meaningful involvement of all stakeholders in the decision-making processes by following a flexible and adaptable strategy.

107. The European Commission has endorsed geological disposal as the favoured strategy for dealing with Europe's long-lived radioactive waste, and is close to implementing its first geological repositories for nuclear waste. The European Union generates about 35 per cent of its electricity from nuclear energy.[37]

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[36] Nuclear Energy Agency, "The disposal of high-level radioactive waste", *NEA Issue Brief*, No. 3 (January 1989).

[37] Neil A. Chapman, "Geological disposal of radioactive wastes — concept, status, and trends", *Journal of Iberian Geology*, vol. 32, No. 1 (2006).

# III. International cooperation: the way forward

108. The rapid increase in volume and type of both solid and hazardous waste is a result of economic growth, technological advance, urbanization and industrialization. Ineffective and inefficient waste management results in adverse impacts on the health of surrounding communities; pollution of land, water and air resources; wastage of potentially valuable materials; and emissions of greenhouse gas. Effective and environmentally sound waste management requires immediate attention from national and local governments, particularly in developing countries. However, waste management systems are costly, and often beyond the reach of poor countries and poor communities. Some technological options are also unavailable for these countries. Finally, poor countries need investment in capacity development in order to manage these tasks effectively. The following elements are indicative of the way forward.

109. First, comprehensive national and local policies on waste management covering all types of waste and all aspects of waste management need to be formulated and rigorously enforced. Policy frameworks to support resource recovery from waste need to be strengthened as well. The economic, environmental and social benefits, as well as the local applicability, of an integrated solid waste management approach with a focus on the 3Rs have been demonstrated, but need to be more widely disseminated.

110. In this regard, the priority objectives are waste prevention and minimization, followed by the effective and efficient management of remaining solid and hazardous waste, focusing on reuse and recycling and on recovery of useful materials and energy. In the future, waste has to be valued as a resource.

111. One successful approach is based on life-cycle analysis, for example, through the application of extended producer responsibility and linking of the waste agenda with that of sustainable consumption and production.

112. Secondly, as mentioned, a significant obstacle to effective waste management is cost. There is a need for investment in the development of low-cost options suitable for poor communities, which could be upgraded as incomes rise. This will require long-term technical cooperation between developed and developing countries. Governments will need to tap the resources and expertise resulting from north-south and south-south cooperation and partnerships. Donor countries can assist developing countries by allocating higher portions of official development assistance (ODA) to waste management programmes, providing a higher proportion of financial assistance in the form of grants and improving donor coordination in implementation efforts.

113. Thirdly, in this regard, the importance of transferring and diffusing appropriate technologies and know-how for waste treatment, recycling and reuse and disposal cannot be overemphasized. This should be backed with proper technical training supported by international and bilateral development agencies. In this context, small-scale entrepreneurs can play a significant role in waste collection and treatment. Ways need to be found of integrating informal waste collection and recycling into formal, better regulated systems. Current international partnerships promoting cleaner production and life-cycle management therefore need to be strengthened.

114. Fourthly, intensive efforts are needed in capacity-building of the relevant stakeholders, including for developing and implementing integrated solid waste management at the local level, and providing policymakers in developing and transition countries with tools for financing waste management. Local authorities, often at the forefront of solid waste management, need institutional capacity-building and the delegation of responsibilities and of financial resources from Governments.

115. It is vital to engage communities and NGOs and other partners in the development of public awareness campaigns and education on waste prevention, waste treatment and health hazards from waste. It is a major challenge to reach the poorest segments of the population such as scavengers and rag-pickers.

116. Public-private partnerships can also play a role in financing and developing waste infrastructure and management systems.

117. Sixthly, such emerging waste streams as electronic waste, waste plastics, and used oils and chemicals require special attention aiming at a high rate of recovery worldwide. Therefore, an assessment of the quantities and characteristics of waste streams needs to be carried out so as to identify programmes and appropriate environmentally sound technologies to promote material and energy recovery. This will help to augment resources, while substantially reducing the final volumes and the toxicity of waste. For this to happen, a comprehensive programme for the transfer of know-how and technologies has to be developed.

118. Seventhly, there is broad consensus among experts that the quality of global data needs to be improved, not only with respect to the current amount of different types of waste generated, but also with respect to the expected future amounts, in order to develop projections that will allow adequate planning for resource recovery and substitution of virgin materials. Scientifically sound waste characterization and quantification for all waste streams and in all high-waste-generating areas need to be carried out. The International Panel for Sustainable Resource Management has started work on estimating the benefits of metal recycling now and in the future, as the basis for more efficient urban mining practices. However, similar work has to be carried out for a number of other materials and eventually for the global material flows.

119. An important first step in that direction is support for the improvement of regulatory frameworks and infrastructures, monitoring and data-collection capabilities for the effective monitoring of waste generation, treatment and disposal, and the establishment of criteria for waste treatment and disposal quality. This should be supported by effective national institutions with the necessary backstopping from the international community.

120. Under the Green Economy Initiative, research is being conducted on win-win options in waste recycling, namely those that lead to improved public health, poverty alleviation, creation of decent jobs, improvements in living standards, the reduction of greenhouse gas emissions and other pollutants, and the extended life of resources. The results would be available for consideration of decision makers, in particular in developing countries and countries with economies in transition.

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# Review of implementation of Agenda 21 and the Johannesburg Plan of Implementation: Mining

## Report of the Secretary-General

*Summary*

Minerals are essential for modern living, and mining is still the primary method of their extraction. Mining activities have in a number of cases generated few or limited benefits to producing countries in terms of economic growth and poverty reduction. In spite of progress since 2002, mining activities still generate adverse social and environmental impacts on communities living next to extraction sites and sometimes at the country level. Therefore, efforts are needed to increase the positive economic impacts of mining in producing countries and minimize the negative social and environmental impacts of mining on affected communities, with support from the international community. It is necessary to improve the basic building blocks of governance required for extractive industries to contribute to sustainable development, including: promoting transparency in revenue flows; promoting disclosure of mining projects; developing the capacity of Governments to manage volatile revenues efficiently; helping Governments develop modern policy and regulatory frameworks; integrating the public in decision-making processes at the local and national levels. In this process, a key element of local sustainable development is ensuring that the rights and interests of indigenous peoples and other local communities are recognized and respected by States and companies.

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# I. Introduction

1. The present report reviews progress in the implementation of Agenda 21,[1] the Programme for the Further Implementation of Agenda 21,[2] and the Plan of Implementation of the World Summit on Sustainable Development (Johannesburg Plan of Implementation),[3] in the thematic area of mining. The report was prepared by the Department of Economic and Social Affairs of the United Nations Secretariat and draws on inputs provided by Governments, major groups and the United Nations system, in particular the United Nations Environment Programme (UNEP), the International Labour Organization (ILO), and the United Nations Industrial Development Organization (UNIDO), and the Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development.

2. For the purpose of this report, mining is defined as the economic activity dedicated to the production of minerals and metals, including exploration, extraction and processing of the extracted minerals. Oil and gas are excluded from the scope of the report, having been considered during the fourteenth and fifteenth sessions of the Commission on Sustainable Development under the theme of "Energy".

# II. Mining and resources at the global level

3. It has been estimated that between 1900 and 2005, the extraction of construction minerals grew by a factor of 34 and that of ores and industrial minerals by a factor of 27. Both factors are higher than the growth during the same period of population, which roughly quadrupled, and gross domestic product (GDP), which increased twenty-fourfold. The rate of increase in minerals extraction was higher in the second part of the twentieth century than in the first part.

4. Resource scarcity per se may not be the most binding constraint to continuing the current development model. Economic reserves for oil, gas and most metals have increased severalfold over the past decades, as a result of new discoveries and technological progress. Therefore, the time when the world is expected to run out of minerals and metals is constantly shifting to the future. The introduction of technologies allowing profitable recovery of metal from lower-grade ore is largely responsible for this increase. For example, following the introduction of the carbon-in-pulp technology, a new cyanide-milling technology, in gold extraction, economic reserves of gold worldwide quintupled within a few years' time at the beginning of the 1980s.

5. The main constraint to sustainability may instead come from the ever-increasing consumption of resources (mostly energy and water) needed to extract minerals and metals, as well as from the increasing pollution generated by the extraction process. At the end of the 1990s, mining consumed about 10 per cent of world energy, and was responsible for 13 per cent of sulphur dioxide emissions.

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[1] *Report of the United Nations Conference on Environment and Development, Rio de Janeiro, 3-14 June 1992*, vol. I, *Resolutions adopted by the conference* (United Nations publication, Sales No. E.93.I.8 and corrigendum), resolution 1, annex II.

[2] General Assembly resolution S-19/2, annex.

[3] *Report of the World Summit on Sustainable Development, Johannesburg, South Africa, 26 August-4 September 2002* (United Nations publication, Sales No. E.03.II.A.1 and corrigendum), chap. I, resolution 1, annex.

6. The example of gold is illustrative. The quantity of water and energy necessary to process gold is a decreasing function of ore grade. As high-grade lodes are gradually being exhausted, the average grade of processed ores has been declining steadily. It has now declined from 5-10 grams per ton before 1980, to 1-2 grams per ton in the United States of America and Australia. Over the past few decades, resource efficiency gains in the use of energy and water in Australia, one of the leading gold mining countries, have just compensated the decline in ore grade, so that the quantity of energy and water needed to extract 1 kilogram of gold has not changed. Given that production has increased severalfold during that period, much more water and energy is used to extract gold than 20 years ago. The same trends apply to the pollution side of metals extraction. The quantity of $CO_2$ emitted to recover 1 gram of gold in Australia is approximately the same as it was 10 years ago. Thus, owing to the increase in gold production, $CO_2$ emitted by the gold mining industry has increased several times since 1980.

7. In addition, the shift from deep mining to open-cast mining that has characterized the last decades has resulted in increasing quantities of waste rocks and tailings. Nowadays, the production of 1 kilogram of gold in Australia typically creates 500 tons of tailings and three times as much of waste rocks. Tailings and waste rocks present problems of permanent acid leaching and must be treated. So far, the predominant treatment is tailing dams, which have caused numerous environmental and health issues. In summary, the combination of sustained increases in minerals extraction and changes in mining processes has resulted in ever-increasing environmental impacts.

8. On a per capita basis, the industrialized regions of Europe and North America use the lion's share of metals and minerals. In 2001, only 0.7 kilograms of aluminium were used a year in Africa per capita compared with 22.3 kilograms in the United States. Americans use about 600 kilograms of metals per person a year. During an average 70-year lifetime, Western Europeans use about 460 tons of sand and gravel, about 39 tons of steel, and 100 tons of limestone to heat houses, produce electricity, or keep cars running.

9. The demand for industrial metals extraction is determined by the demand for metals as inputs to the production process. However, the relationship between the two is mitigated by the extent of recycling that takes place. Final demand for metals in turn is determined by the final demand for products, and affected by two factors: (a) increased material efficiency, i.e., reducing the quantity of metals needed to produce one unit of product; and (b) material substitutions in the production process, where metals are replaced by other components.

10. On the other hand, the demand for gold, diamond and gemstones, the extraction of which is the main focus of small-scale and artisanal mining in many countries, is largely determined by individual consumers. Unlike most luxury commodities, the largest areas of gold consumption are found in developing countries. Given the acute environmental and social impacts of artisanal gold mining when carried out in ways that do not mitigate environmental and occupational safety and health effects, there has been a call on the part of non-governmental organizations to reconsider the necessity of mining this metal, when more supplies of gold are above than below ground. This is especially true since gold is eminently recyclable.

11. Increased recycling appears to offer great potential for further gains in material efficiency. Recycling of waste materials back into industrial production not only reduces requirements for the extraction and processing of virgin natural resources, but also saves much of the energy consumed by extraction and processing, and reduces the amount of waste going to landfills or incineration. Energy savings from the use of recycled metals are about 95 per cent for aluminium, 85 per cent for copper, 68 per cent for steel, and 60 per cent for lead and zinc. Steel production from scrap in the electric arc furnace requires about one third of the energy required for steel production from iron ore in a blast furnace, reduces air pollution by 85 per cent and water use by 40 per cent.

12. Recycling is generally more cost-effective for waste from industry and business than for household waste. However, household recycling is more cost-effective for aluminium, other metals and paper than it is for plastics and glass. In member countries of the Organization for Economic Cooperation and Development, all of which now have a variety of recycling programmes, municipal waste recycling rates for metals are increasing and now average over 80 per cent.

13. Incentives to recycle metals are affected by their prices. Increased prices for most metals during recent years have increased the incentives for recycling. However, mining subsidies, explicit or implicit, reduce the cost of mining and the economic incentives for metal recycling. Ensuring that the prices of metal reflect the full costs of mining, including externalities, would increase incentives for recycling.

14. Further increasing reuse and recycling of metals depends on addressing a number of bottlenecks. First, geographic dispersion of the waste products (as opposed to geographic concentration of mining sites and smelters) makes it a logistical challenge to provide the necessary transportation and disposal links to be able to reuse the material. However, some sites (e.g., for car dumping and metal dumping) are centralized at the municipal level, thus making it possible to devise logistical chains for reuse and recycling. Second, the design of products generally does not internalize the need for easy recovery of raw materials after the product's life has ended. This in turn can be related to the absence of life-cycle or production chain responsibility for producers. This has started to change in some countries for some lines of products (e.g., electronics, appliances) through extended producer responsibility requirements, which make industry responsible for associated waste products, including end-of-life products. These policies appear to be fairly effective in increasing recycling.

## III. Mining, economic development and poverty reduction

15. At the national level, the contribution of mining to development and livelihoods and poverty reduction can be examined through the contribution of mining to the economy, in terms of direct and indirect employment, income generation opportunities, and revenues accruing to Governments. In more than 30 countries, mainly but not exclusively developing ones and countries in transition, the mining and mineral sector occupies a significant place in the national economy. Australia relies substantially on mineral commodities for export income. In Ghana, mining output constitutes about 8 per cent of GDP. In South Africa, which is responsible for more than 70 per cent of the region's mining output, the figure is

9 per cent.[4] Botswana, the Democratic Republic of the Congo, Namibia and Zambia derive over 50 per cent of their export earnings from mining. In Latin America the contribution is also important. In the Plurinational State of Bolivia, Chile and Peru, mining contributes to between 30 per cent and 50 per cent of the total value of exports.

16. ILO provides a global estimate of 25 million people involved in mining (excluding oil and gas), about half of whom are informal workers. Taking into account dependants, the ILO estimates that the number of people relying on mining, both large and small scale, for a living is likely to be about 300 million.

17. For a long time, productivity gains in the mining industry resulting from major capital investments have caused a sharp fall in employment in the mining and mineral processing sectors worldwide. However, this trend seems to have been reversed since the turn of the century, with employment in mining increasing in a sample of 67 countries covered by ILO statistics, from 10.2 million in 2003 to 11.4 million in 2007.

18. Large-scale mining, owing to its very capital-intensive nature, generates little direct employment in comparison to other industries or economic activities. Large industrial mines are heavily mechanized and the need for low-skill labour is very limited. In Mali, it was estimated that there is one job generated for each $700,000 invested in large-scale gold mines, several times less than what investments in other activities typically generate. In Ghana, in spite of large investments in the mining sector, large-scale mining corporations employed only 20,000 nationals at the turn of the century.

19. While no global estimates are available, experts agree that the number of artisanal and small-scale mining operations has increased sharply during the past few years, fuelled by sharp increases in commodity prices. For example, between 2001 and the end of 2009, international gold prices more than quadrupled, making small deposits more economical to mine.

20. While some countries have managed to create and support a strong industrial base connected to extraction of minerals and metals, in other contexts mining, similar to other extractive industries, has generated few spillovers and linkages with the other sectors of the national economy. Mining operations have often worked in isolation from the rest of the economy. Local firms, which could in principle provide services to the oil and mining companies, often do not meet the standards that those companies require. Local firms may also have insufficient capacity to deal with the process required to bid for and participate in local development projects.

21. In addition, forward linkages with the rest of the economy often do not exist because raw minerals mined in one country are processed in other countries. Finally, developing countries that have promoted downstream industries have faced tariff and non-tariff barriers to their exports. The creation of strong linkages has been a major concern in many countries such as Botswana, which have initiated so-called beneficiation programmes in an attempt to capture value from their mineral resources, e.g., by instituting local diamond and gemstone cutting.

[4] United Nations Statistics Division, 2009.

22. At a macroeconomic level therefore, the positive impacts of mining on economic development importantly depend on the portion of the resource rents that goes back to Governments, and on the way revenues generated by mining and accruing to Governments are spent. With regard to the former, during the 1990s many countries revised their legal and regulatory framework applying to mining with the hope of attracting foreign direct investment in the sector. In the African context, the revised mining codes often offered low royalties, tax exemptions, exemption of import and export duties, and repatriation of profits. It has been argued by some observers that the balance has tilted too far in the direction of private companies. In other regions, the tendency has been towards a renationalization of mineral resource sectors.

23. Given the importance of revenues from mining in many developing countries and their non-renewable character, their efficient use for development is crucial. However, in many cases these revenues have not contributed as much as expected to sustainable development. The Extractive Industries Review undertaken for the World Bank, which has become a reference point for many stakeholders in the mining sector, concluded that attracting foreign direct investment in the mining sector was not per se a sufficient condition for poverty reduction. In order for poverty reduction to take place, numerous preconditions have to be in place before resource extraction starts. The final report of the Extractive Industries Review highlighted three main preconditions: (a) pro-poor public and corporate governance; (b) much more effective social and environmental policies; and (c) respect for human rights.

24. Artisanal and small-scale mining, understood as encompassing small and medium mining enterprises that use sometimes rudimentary techniques to extract mineral substances, is often present in countries with valuable deposits of gold, diamonds and precious gemstones, where it often coexists with large-scale mining practised by large companies, often multinational corporations. Although recent and precise figures for the populations engaged in artisanal and small-scale mining activities worldwide are not available, by some accounts the number of people depending on this type of activities has grown since the last global numbers were published by ILO in 1999. At that time, it was estimated that 13 million people were engaged in artisanal and small-scale mining. In China in 2006, artisanal and small-scale mining was estimated to employ more than 5 million people, representing 53 per cent of those employed in the mining industry, while generating 41 per cent of total production value.

25. Artisanal and small-scale mining is thought to have developed rapidly in Africa in the 1990s, partly as a consequence of Structural Adjustment Programmes that have retrenched thousands of former civil servants, as well as reforms undertaken by many countries to attract foreign investment in the mining sector, which have resulted in massive land transfers to private companies in the form of concessions. According to the Ghana Chamber of Mines statistics, 13 per cent of the land area of Ghana is currently under concession to mining companies, representing an estimated 40 per cent of gold-mineralized land in the country. In some countries the importance of those land transfers is thought to have severely limited local possibilities for livelihoods based on the exploitation of land, including agriculture.

26. It is widely recognized that the development of artisanal and small-scale mining is largely a product of poverty and lack of viable alternative livelihoods. In

Mozambique, artisanal miners typically report earnings in the range of $140-160 a month, which is four times as much as subsistence farmers in the neighbouring provinces earn from cash crops.[5] In Suriname, studies suggest that small-scale mining acts as an alternative economic occupation when the national economy is experiencing stress, for example in the form of hyperinflation, or when specific groups are excluded from alternative occupations. In reality, the choice facing many miners may not simply be between mining and some other activity (typically farming), since mining may be a secondary occupation used to raise money for investment in farming.

27. A large part of the artisanal and small-scale mining sector operates at the fringe of or outside legality, ignoring factors such as existing property rights (that commonly vest all mineral rights in the State), work safety and environmental regulations, and taxation systems. In some countries, this has deprived Governments of sources of foreign exchange and facilitated the entrenchment of parallel trade networks. It is estimated that in Mozambique, only 10 to 15 per cent of the gold produced by artisanal miners is bought by the Government. In Madagascar, almost all of the $400 million worth of gemstones mined each year is exported illegally. In some contexts the rents that do not accrue to the State have financed networks engaging in more or less open promotion of civil warfare, as in the case of diamonds and other rare, easily portable and highly valuable minerals from certain parts of Africa.

28. Many countries have tried to formalize artisanal and small-scale mining activities by integrating them into the formal economy. However, policies in that direction have so far met with little success, and populations involved in artisanal and small-scale mining activities have continued to grow in many countries. In addition to the geographic dispersion and mobility of the artisanal and small-scale mining activities, which make them inherently difficult to control, failure of many formalization programmes has been attributed to the following shortcomings: insufficient knowledge of the populations involved in artisanal and small-scale mining and their dynamics; absence of credible and viable alternative livelihoods, especially in many donor-funded projects that have sought to promote alternative livelihoods to such mining; insufficient economic incentives for miners to formalize, given high monetary and non-monetary costs of the administrative processes involved, and the low probability of getting licence requests accepted; and the disconnect between legally permitted areas for small-scale extraction and the geographic distribution of mineral deposits. Also, in some countries government support is provided only to legal mining communities, leaving a large portion of the mining population outside the scope of capacity-building and awareness-raising programmes. As a result, small-scale miners have little or no incentive to move to designated areas and instead tend to remain in unauthorized settlements. This is reinforced by a context in which artisanal and small-scale mining is only gradually being addressed within national poverty reduction policies, and is segregated from district-level planning.

29. Studies in contexts as different as China and the United Republic of Tanzania have concluded that the contributions of artisanal and small-scale mining to

[5] S. Dondeyne, E. Ndunguru, P. Rafael and J. Bannerman, "Artisanal mining in central Mozambique: Policy and environmental issues of concern" (2009), *Resources Policy*, vol. 34 (1-2), pp. 45-50.

livelihoods and poverty reduction outweigh its negative impacts, but that Governments need to exert a greater effort to regulate, guide and encourage the development of artisanal and small-scale mining and to create a sound environment for its operations. The studies generally conclude that marked environmental and socio-economic improvements could be achieved within artisanal mines if the Government provided institutional and technical support to local operators and improved laws and regulations applying to the small-scale mining sector.

# IV. Environmental and social impacts of mining

## A. Environmental impacts

30. The environmental impacts associated with mining activities, which vary from region to region depending on mining and disposal technologies and local features, include the nature of the ore/mineral; the depth of the deposit; the chemical composition of the extracted matter and the surrounding rocks; naturally occurring substances; topography; climate; and reclamation practices.

31. For surface mines, the main environmental problems are large-scale land use, overburden removal and disposal, soil loss and erosion, disturbance of hydrology, siltation of rivers and pollution of water sources, acid mine drainage, fugitive dust, and reclamation. For underground mines these problems are: mine water drainage; methane emissions; and fugitive dust. Other environmental effects of mining activities include transport of hazardous materials, deterioration of air and water quality, noise, vibrations, and visual impacts. If not managed well, many of these can adversely affect the health and livelihood of the poor and vulnerable groups living near mining operations and sometimes at significant distances from extraction sites.

32. The large quantities of toxic waste that can remain from mining operations must be carefully managed in order to avoid water pollution through leaching and to prevent failure of structures and dams built to contain the waste. Mining operations break up the terrain and hence increase the surface area exposed to rainfall. Although waste-rock contains low concentration of toxic elements, the clays and silts eroded can cause streams to become burdened with suspended solids. Run-off harms can be more severe where sulphide deposits are being worked or where high-sulphur coal is being extracted. Drainage of acid water from mine sites is a serious problem in areas with significant rainfall. Surface water infiltrates the rock debris left after mining, where it reacts with sulphide materials to produce sulphuric acid, polluting streams and groundwater resources.

33. The disposal of tailings from mining has been a pervasive cause of environmental damage. Riverine tailings disposal has been criticized as destroying ecosystems and polluting water sources. The effects of submarine tailings disposal are not well known but there are fears that it can have harmful effects on marine ecosystems and adversely impact the livelihoods of communities depending on those ecosystems, such as coral reefs that have important ecological functions or cultural significance or coastal waters used for subsistence purposes. This mode of waste disposal is used mainly in a number of developing countries, and it is effectively banned under the Clean Water Act in the United States of America.

34. A legacy of abandoned mine sites and quarries bears witness to the unsatisfactory environmental performance of the industry in the past. These abandoned sites spoil the landscape and can pose severe environmental threats owing especially to acid mine drainage. The legal responsibility for environmental restoration of these sites is often unclear, because of deficiencies in the legal framework or difficulty in identifying the responsible parties. In the United States of America today, a company opening a new mine is required by law to buy a bond by which a separate bond holding company pledges to pay for the mine's clean-up cost in case the mining company itself goes bankrupt. But for many mines, the eventual clean-up costs have proved to exceed the value of the bond. Older mines were not required to buy such bonds at all.

35. The lack of guarantees for clean-up costs often leaves those costs to the public. In the United States of America, although uncommon, environmental expense can exceed hundreds of millions of dollars per development. The cost of cleaning up some 550,000 abandoned hard rock mining sites in the United States is estimated by the Environmental Protection Agency to be in the range of $32 billion to $72 billion.

36. Reclamation and restoration of the land after mine closure has been a significant challenge that has not been satisfactorily addressed in many countries. For example, the Economic Commission for Europe notes that, in parts of South Eastern Europe, "poor or negligible implementation of mine rehabilitation and closure activities has resulted in, and continues to cause, significant adverse environmental and health and safety impacts and related liabilities".[6]

37. Small-scale gold mining uses mercury for amalgamation, sometimes in combination with cyanide. Mercury is used by small-scale gold miners in more than 50 developing countries, where significant releases of mercury are associated with inefficient amalgamation techniques. Mercury releases from artisanal mining are estimated to account for more than half of total mercury releases and are estimated to range from 800 to 1,000 tons per annum. Unmonitored releases of mercury from gold amalgamation have caused considerable environmental contamination and human health complications in rural reaches of sub-Saharan Africa, Latin America and Asia. Amalgamation followed by cyanidation poses additional environmental and health consequences, as mercury-contaminated tailings may interact with cyanide in ways that increase the bioavailability of mercury in the environment.

38. In recent years, strategies to tackle mercury pollution from artisanal gold mining have mainly included restrictions — banning mercury trade internationally, prescribing alternative technologies and tightening regulations on mining (e.g., banning mercury use). However, artisanal miners often find it difficult to improve technologies and reduce mercury pollution. Research has advanced the hypothesis that pollution abatement strategies fail if they do not explicitly address local socio-economic capacities for improving environmental management.

39. Mercury use has been one of the main targets of interventions by United Nations agencies, international financial institutions, and donors, including the UNIDO-led Global Mercury Project. Interventions have focused on limiting the adverse environmental and health impacts of mercury release by small-scale mining operations. Improved intervention strategies have now been developed to overcome

[6] See note by the ECE secretariat (ECE/AC.25/2009/3, para. 82), prepared for the Fourth Regional Implementation Meeting on Sustainable Development.

the challenges identified by previous generations of projects, which included: lack of adaptation of technical solutions to local values or materials, as well as high costs of proposed techniques; implementation of technical facilities (such as centralized mercury mills for gold amalgamation) without proper consideration of local demand and local dynamics of the mining communities; and dilution of the effect of awareness-raising campaigns due to rapid changes in mining populations.

40. Overall, much uncertainty remains in identifying when and where the potential environmental and social costs of mining are too high. Non-governmental organizations and companies have developed general principles and criteria for identifying areas that should be off-limits to mining, oil and gas development. Attempts have also been made to identify what might constitute "vulnerable ecosystems". Although global and national policy debates often centre on "no go" areas on land that is already subject to legal protection, mining in important ecosystems that are not adequately protected may pose an even greater threat. Global analysis undertaken by the World Resources Institute showed that more than one quarter of the world's active mines and exploration sites overlap with or are within a 10-kilometre radius of a strictly protected area; nearly one third of all active mines and exploration sites are located within areas of intact ecosystems of high conservation value; almost one third of all active mines are located in stressed watersheds; nearly one fifth of active mines and exploration sites are in areas of high or very high seismic hazard; and more than one third are in areas that may be predisposed to water quality problems.

## B. Social impacts

41. The mining industry can have important impacts on social development, some positive but many negative. One pervasive problem is that capital-intensive mining operations generate limited local employment opportunities. Yet, their claims on mineral resources — sanctioned by concession agreements with national Governments — frequently bring them into conflict, at times violent, with local communities over land, water and other natural resources on which those communities depend for their livelihoods. Absence of (or merely pro forma) consultation with local and indigenous communities on decisions to start and operate mining activities has remained a pervasive issue.

42. According to the provisions of the United Nations Declaration on the Rights of Indigenous Peoples, extractive industries must not operate on indigenous lands or territories without obtaining the free, prior and informed consent of the relevant communities and indigenous peoples. This includes the right to refuse extraction or exploration. Free, prior and informed consent is conceived as a right and not an obligation and it is therefore up to the indigenous peoples to determine whether they will engage in discussions or not, as discussed in the 2009 report of the international expert group meeting on extractive industries, indigenous peoples' rights and corporate social responsibilities. These rights are widely recognized and were recently reinforced by the Inter-American Court of Human Rights, which noted that members of tribal and indigenous communities have the right to own the natural resources they have traditionally used. Without them, the very physical and cultural survival of such peoples is at stake. When large-scale development or investment projects could affect the integrity of such peoples' lands and natural resources, the State has a duty to obtain their free, prior and informed consent.

43. In many places there remain basic ambiguities regarding the legal basis for resource and tenure rights. Indigenous peoples in particular have suffered from lack of recognition of their rights over land and resources, as well as from lack of enforcement of such rights when they exist. Resettlement of local population following the granting of concessions to mining companies has often been decided without prior information or consultation of the populations involved, and has not been adequately compensated, especially in cases where traditional subsistence patterns were radically affected by mining developments. This has often led to direct conflicts and militarization of mining areas.

44. Conflicts between small-scale miners and large-scale mining companies have occurred over land ownership and use rights. Attempts by Governments to enforce companies' rights in concession areas have often resulted in evictions and resettlement of artisanal miners. In that respect, in some countries large mining companies have been criticized for not allowing small-scale miners to use the parts of mineral-bearing land in their concessions that were not economically profitable for large-scale mining. The absence of legal instruments allowing for transfers of land rights has been mentioned as an obstacle to improvements in that regard. Conflicts have also occurred with authorities when communities perceive they are denied the right to exploit mineral resources that they consider theirs, including in protected areas.

45. Working conditions and related health issues in the mining sector have been a cause of concern. A large number of children work in artisanal and small-scale mining. In Papua New Guinea, for example, children provide up to 30 per cent of the small-scale mining workforce. According to ILO, although it only accounts for 0.4 per cent of the global workforce, mining is responsible for over 3 per cent of fatal accidents at work. Especially where regulation is lax, mineworkers face serious safety and health problems — such as exposure to dust, mercury and other chemicals, as well as poor ventilation, inadequate space and overexertion. The risks of death or fatal injuries caused by explosions, falling rocks or poor equipment are very high. Silicosis and mercury poisoning are occupational hazards of small-scale mining that also extend to people living in the surrounding community. In some cases symptoms take many years to manifest themselves, as in the case of asbestos-related diseases. Asbestos is now banned in a large number of countries.

46. To date, 23 countries have ratified the 1995 ILO Convention No. C176 on Safety and Health in Mines. Given that this Convention provides a framework to achieve continuous and sustainable occupational safety and health improvements, its ratification could dramatically improve laws and regulations in those countries where mine safety is weak and where no coherent occupational safety and health policy exists for the sector. Improving working conditions in the artisanal and small-scale mining sector will remain a challenge as it operates largely outside the law with minimum work safety and health standards.

47. Women provide up to 50 per cent of the small-scale mining workforce, but their compensation typically lags behind that of male mine workers. In some countries, mining has been a driver of labour migration, with miners living in single-sex hostels far from their families. In South Africa, this has played a significant part in the rise of the HIV/AIDS epidemic, with infected miners bringing the disease back with them to the rural areas. Increased vulnerability of women in informal mining communities, high prevalence of HIV/AIDS, and exposure of

pregnant women to mercury vapours are serious issues. Studies suggest a growing need for policies to address female employment in artisanal and small-scale mining and, more generally, rural employment.

48. Social Impact Assessments are often mandated by laws and regulations for all proposed mining projects. While the goal of Social Impact Assessments is to identify and address potential social issues proactively, a number of weaknesses of this and related instruments have been identified. They include insufficient scope; lack of a comprehensive approach addressing all relevant issues; lack of integration of social, environmental and economic issues; an overly technocratic approach; and the static nature of these exercises. Generally speaking, the social side has been dubbed the "weakest pillar" of sustainability assessment. The demand for greater integration of social and environmental impact assessments is supported by the Extractive Industries Review.

## C. Responses by the mining industry

49. In response to the environmental and social issues highlighted above, the mining sector has put in place tools for improved resource efficiency and pollution minimization, as well as tools to minimize adverse impacts of mining activities on the surrounding communities and natural environment. Many companies have also stepped up their engagement in corporate social and environmental responsibility activities.

50. Large mining companies have increasingly adopted voluntary initiatives, both external and emanating from the mining industry itself. Those include voluntary programmes such as industry codes (e.g. ISO 14000 standards); adherence to the Global Reporting Initiative and Global Reporting Initiative Mining and Metals Sector Supplement reporting requirements; and adherence to principles promoted by industry associations, UNEP, ILO and others, such as the Tripartite Declaration of Principles concerning Multinational Enterprises and Social Policy and the sustainability principles of the International Council on Mining and Metals, in conjunction with the "Enduring Value" implementation guidance. They also include more specific guidelines covering technical aspects of the mining process, such as international guidelines on the use of cyanide and other toxic chemicals.

51. Cleaner production technologies have been increasingly used by mining companies, as they have a direct impact on their financial bottom line. Preventive environmental management practices such as waste minimization and eco-efficiency, and analytical tools such as Life Cycle Assessment and Industrial Ecology, have been customized by the minerals-processing industry for process designs, input substitutions, in particular for toxic chemicals, plant improvements, continuous improvement in operation and maintenance practice and systems, and reuse, recovery and recycling of process waste streams.

52. Current pollution minimization practices and policies adopted at the operations of the major mining companies include environmental management systems, advanced pollution control technologies, environmental awareness training for employees, and increased accountability for environmental impacts as required by company stakeholders. In Australia's mining and mineral-processing industries, a recent study found that improvements had been made and policies aiming at pollution minimization implemented over the previous few years.

53. Recent years have seen an increase in the importance that large mining companies give to enhancing their voluntary corporate social and environmental responsibility initiatives, which have become more integrated with the mining companies' bottom lines. Mining companies have also stepped up their engagement in social issues arising in mining or neighbouring communities, beyond the customary health and education programmes. The enlarged scope of concern of mining companies now encompasses informal settlements, HIV/AIDS issues, and crime, all seen as factors directly affecting worker productivity and the reputation of the firm.

54. This shift has been related both to market pressures from institutional investors and stock exchange regulations on corporate governance in the case of listed firms, and to stepped-up government demands regarding the contribution of mining firms to social and economic development. For example, in South Africa, the Black Economic Empowerment scorecard, introduced by the Government as a tool to measure performance and provide a basis for renewing mining licences, has been mentioned by all stakeholders as instrumental in promoting more ambitious and better integrated corporate social and environmental responsibility activities. As a result, the trend has been to increased transparency on environmental and social performance of large companies.

55. While corporate social and environmental responsibility initiatives generally represent progress, some concerns have been flagged. Lack of coordination of corporate social and environmental responsibility strategies with other development partners (State, municipalities, non-governmental organizations) has been mentioned. Another concern is that, in some countries, those initiatives may act as a substitute for rather than complement to government investment in infrastructure and social services in the producing regions. The amounts invested by companies through those initiatives are generally small by comparison with the revenues from mining accruing to the central Government. While a share of such revenues should normally return to the producing regions, disagreements are commonplace regarding what constitutes a fair share. Broad publicity of corporate social and environmental responsibility initiatives by mining firms has sometimes been criticized as masking the companies' unwillingness to engage meaningfully with local communities, recognize their obligations to keep the environment clean, or at least compensate fairly those directly affected by their activities.

# V. Governance in the mining sector

## A. International governance

56. Control over natural resources is governed according to the principle of national sovereignty. As stated by Principle 21 of the Stockholm Declaration, "States have ... the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction".[7] National sovereignty over

[7] *Report of the United Nations Conference on the Human Environment, 5-16 June 1972* (United Nations publication, Sales No. 73.II.A.14 and corrigendum), chap. I.

the use of natural resources was reaffirmed in 1992 in the Rio Declaration of the United Nations Conference on Environment and Development.[8]

57. The Intergovernmental Forum on Mining, Minerals, Metals, and Sustainable Development, an outcome of the World Summit on Sustainable Development, currently serves as the only global intergovernmental policy forum in the mining and minerals sector. The Intergovernmental Forum on Mining, Minerals, Metals, and Sustainable Development is a voluntary initiative officially established in 2005 by national Governments interested in promoting good governance in the management of mineral resources.

58. Since 2002, major international multi-stakeholder initiatives have been launched, targeting more transparency over the revenues generated by mining activities by both companies and Governments. These include the creation of the Kimberley Process Certification Scheme, which imposes stringent requirements on trade to ensure that so-called "conflict diamonds" are not traded; the Publish What You Pay Campaign, an international campaign led by a coalition of non-governmental organizations calling for the mandatory disclosure of tax, fee and royalty payments made by companies to Governments for the extraction of minerals; and the Extractive Industries Transparency Initiative.

59. The Extractive Industries Transparency Initiative supports improved governance in resource-rich countries through the verification and full publication of company payments and government revenues from oil, gas and mining. The Initiative works to build multi-stakeholder partnerships in developing countries in order to increase the accountability of Governments. Some 20 countries have either committed to, or are now actively implementing the Extractive Industries Transparency Initiative in Africa, Asia, Europe and Latin America. The World Bank has also taken a strong position in support of the Extractive Industries Transparency Initiative, stating that transparency is the key to development in resource-rich countries. However, transparency is not a core condition for lending.

60. Many experts on the mining sector have mentioned that the Extractive Industries Transparency Initiative, while going in the right direction, does not fully address transparency issues linked with the mining industry. Firstly, the Initiative does not require but "encourages" Governments and companies voluntarily to develop a framework to promote transparency of payments and revenues. Secondly, it does not address the questions of allocation and use of the revenues from mining once they reach government coffers.

61. In addition, various initiatives from mostly non-governmental stakeholders have tried to promote certification schemes that would address environmental and social issues associated with the mining of gold and precious stones. The objective would be to reward miners using clean production methods (i.e., without using mercury or harmful chemicals such as cyanide) by allowing them to obtain a higher market price through certification. Inexpensive but reliable methods to distinguish environment-friendly recovered gold apparently exist. The Association for Responsible Mining, in conjunction with the Fairtrade Labelling Organizations, has created a set of principles known as Standard Zero to define fair trade gold. They are in the initial phases of testing these standards in Latin America.

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[8] *Report of the United Nations Conference on Environment and Development, Rio de Janeiro, 3-14 June 1992* (United Nations publication, Sales No. E.93.I.8 and corrigenda), vol. I.

## B. National governance

62. The so-called resource curse, or paradox of plenty, holds that countries that are heavily dependent on the extractive industries perform less well economically than other countries, all else being equal. The evidence behind the resource curse hypothesis is still a matter of debate, however. Exceptions to the resource curse include, for example, Botswana and Chile, which are frequently cited as countries that have managed the revenues generated by extractive industries well. However, many countries have had, or currently have, difficulties managing the revenues produced by their extractive sectors.

63. In a number of countries, internal and external conflicts or episodes of civic unrest can be related to control of mineral resources. In many cases, the issues at stake involve the control of the revenues generated by mineral resources, and especially the part of those revenues that benefits the producing regions. In other contexts, the debate is over the transparency of the revenues received by Governments from mining companies, and the degree to which their allocation and use is subject to public scrutiny. Tensions can also arise in stable countries over the issues of adequate compensation of host communities for environmental damage and loss of livelihoods caused by mining activities.

64. Several countries receiving a massive inflow of revenues from natural resources have experienced to varying extents a decline and loss of competitiveness in their manufacturing sectors or have failed to diversify their economies beyond the extractive sectors. This effect, the so-called Dutch disease, has been explained by increases in exchange rates caused by the influx of resources in economies with limited absorptive capacities. This has left some developing countries vulnerable to high price volatility of minerals as compared to manufactures as well as prolonged downturns in mineral prices.

65. Risks of Dutch disease are now well understood and a number of countries have taken measures to prevent it. Investments in education and infrastructure are a long-term way to increase the competitiveness of the manufacturing sector, thereby mitigating the effects of Dutch disease. Another way of preventing Dutch disease is to isolate the revenues from mining, or the windfall part of them, from the rest of the economy. In some countries such as Peru, Chile, Ghana and Botswana, the totality or a portion of the revenues from minerals is set aside in a special fund, whose uses are defined by law. Some countries have explicitly recognized the need to set aside some part of the revenues for future generations. Others have used funds for macroeconomic stabilization purposes, accumulating excess revenues when prices are high in order to channel revenues into the budget when prices are low, thereby smoothing out government expenditure. Yet others have recognized the inflationary and other macroeconomic risks caused by the accumulation of revenues in national economies with limited absorptive capacities, and use at least part of the fund proceeds only for investment abroad.

66. In some countries, revenues from extractive industries are said to heighten corruption. Exclusive reliance on revenues from minerals extraction also potentially weakens the accountability link that exists between the Government and the people through taxes.

67. Lack of transparency regarding the revenues received by Governments from mining companies has been an obstacle to efficient use of these revenues for

sustainable development. Several factors have contributed to this situation. One is the lack of transparency and disclosure of exploitation contracts signed between Governments and companies. The proliferation of project-specific investment agreements, in contrast with a general framework for sharing of revenues between companies and the Government, reinforces the opacity of the revenues for the public. Another factor is the mere complexity of the tax regime applying to mining companies. For example, in Mali, companies mining gold are subject to 27 different taxes.

68. The Extractive Industries Transparency Initiative and the Publish What You Pay campaign have contributed to improving the situation, by allowing figures on the amounts paid by companies to Governments to be made public and thereby generating debate within countries over transparency and accountability issues. However, analyses of the implementation challenges of the Extractive Industries Transparency Initiative and the Kimberley Process Certification Scheme in Sierra Leone have highlighted the fact that the introduction of complex monitoring processes associated with these schemes may represent a significant challenge for countries emerging from conflicts and isolation, suffering from serious shortages in human capacity, and where good governance, accountability and transparency will take time to develop. The existence in many countries of entrenched illegal networks for trading diamonds and gold, often acquired from artisanal and small-scale operators operating outside the formal law, adds a degree of complexity to the introduction of processes such as the Extractive Industries Transparency Initiative and the Kimberley Process Certification Scheme.

69. Transparency over the allocation and use of revenues is even more difficult to achieve. There is often a lack of communication mechanisms between institutions involved in revenue management. Lack of information on budgets at all levels of society is a major limiting factor, which often generates uncertainties at the local level over how much revenue should be received from the Government. Simple actions which have been proven to make a difference in terms of transparency include: supporting local radio stations in vernacular languages, both as a means to reinforce the voice of local communities (by providing channels for conveying priorities and needs) and for education purposes (sharing budget information); promoting better dissemination of budget information; and promoting communication between institutions (e.g., by support for printing budget sheets and distributing them).

## VI. Institutional and technical capacity issues

70. Adequate capacities at the national and subnational government levels for planning, dealing with companies, representing the interests of all parties, enforcing regulations relating to health, working safety and the environment have been found to be lacking in many countries. While regulatory trends are moving towards the decentralization of powers and functions to lower levels of government, in general local governments often lack sufficient financial and human resources to effectively monitor compliance and drive mining activities towards more sustainable practices. Lack of qualified personnel for the enforcement of health and work safety regulations, as well as environmental regulations, is a serious issue in many countries.

71. Inconsistency between national development plans and actual investments is a general concern that goes beyond mining sector issues. Lack of capacity of both central governments and local governments to design and implement development projects is a serious hurdle. The inability of certain sectors to spend quickly has sometimes been used as a justification for shifting funds from priority sectors to others with higher capacity to disburse quickly, such as construction or roads. This bias can result in inefficient projects. At the same time, projects with a significant impact on long-term development, e.g., in health or education, which are generally identified as priorities in national development plans, often receive lower priority in budget allocations. Lack of information-sharing and cooperation between sectors and levels of government can reinforce these inconsistencies.

## VII. Continuing challenges

72. Addressing the sustainability issues highlighted in the present report requires a broad perspective. Mining activities have in a number of cases generated few or limited benefits to producing countries in terms of economic growth and poverty reduction. In the meantime, the process of mining itself generates adverse social and environmental impacts on communities living next to extraction sites and sometimes at the country level. Environmental and other social costs associated with the production and use of mineral resources have been rising with the increase in extraction globally.

73. Simultaneous efforts to decouple economic growth from mineral extraction, increase the positive economic impacts of mining in producing countries, and minimize the negative social and environmental impacts on affected communities are needed and have to rely on aggressive government actions in four broad directions.

74. One such direction is to increase the share of recycling of metals. Apart from removing implicit and explicit subsidies to mining, which negatively affect the incentives for recycling metals, increasing reuse and recycling of metals depends on addressing a number of bottlenecks, a few of which have been highlighted in this report.

75. A second direction is to improve the basic building blocks of governance required for extractive industries to contribute effectively to sustainable development, including: promoting transparency in revenue flows; promoting disclosure of mining projects; developing the capacity of Governments to manage fluctuating revenues; helping Governments develop modern policy and regulatory frameworks; and integrating the public in decision-making processes at the local and national levels. In this process, a key element of local sustainable development is ensuring that the rights and interests of indigenous peoples and other local communities are recognized and respected by States and companies.

76. A third direction is to help Governments in producing countries make the most of their mineral resources by ensuring productive investment and other uses of mining revenues, and creating stronger forward linkages between mining and the rest of their economies, allowing for the creation of dynamic industrial sectors.

77. At the same time, increased efforts must be made by Governments, with support from the international community, to minimize the negative social and

environmental impacts of mining. Although it has progressed since the World Summit on Sustainable Development, the integration of sustainability into legal frameworks for mining is still in the formative stages. Much more needs to be done in order to shift the emphasis from restoration to prevention. There is an urgent need for action in order to integrate environmental and social management systems in the full mining life cycle and to enhance the use and reach of integrated environmental and social impact assessments. Capacity-building is needed at many levels to allow Governments to reap the benefits of mining activities while avoiding or limiting their adverse impacts.

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**Thematic cluster for the implementation cycle 2010-2011 — review session**

# Review of implementation of Agenda 21 and the Johannesburg Plan of Implementation: a 10-year framework of programmes on sustainable consumption and production patterns

## Report of the Secretary-General

*Summary*

Eco-efficiency has been improving throughout the past century. Still, absolute consumption of resources has continued to increase with population and gross domestic product in both developed and developing countries and has even accelerated since 2000 with the rapid growth of emerging economies. Yet large segments of the population in developing countries still lack access to basic goods and services. It is also becoming clear that development has exceeded the carrying capacity of ecosystems in various geographic areas, whether measured using a "footprint" analysis or any number of indicators such as endangered species, degraded ecosystems and land, deforestation or decline in fish stocks.

Therefore, more concerted efforts will be needed to delink economic growth from natural resource extraction and environmental degradation, and to mainstream sustainable consumption and production in policy development and implementation. A life-cycle approach is valuable in gaining perspective on how consumption and production choices are interrelated and can have complex, sometimes unintended, consequences for sustainable development.

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Particular attention is needed to consumption choices, where progress towards sustainability has been limited. The concept of green economy, or green growth, is gaining wider currency as a way of reconciling environmental sustainability with continued improvement in living standards, particularly in developing countries. Best practices are emerging on sustainable procurement, renewable energy, energy efficiency, green buildings, sustainable supply chain governance, and mainstreaming corporate responsibility. Less is known about the proper mix of measures — voluntary, market-based and mandatory — that can lead to sustainable consumption and production. Yet, in many cases, the constraints are behavioural and political rather than technological, calling for more awareness-raising and education.

The challenge of a 10-year framework of programmes on sustainable consumption and production patterns is to facilitate a swift shift in unsustainable consumption and production patterns in order to remain within the carrying capacities of ecosystems while ensuring upward convergence in living standards across the planet.

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# I. Background

1. The present report provides a brief review of the state of implementation of the goals and commitments related to changing unsustainable patterns of consumption and production as mandated by the Commission on Sustainable Development at its eleventh session.[1] It highlights continuing challenges as well as constraints and obstacles that countries face in implementing policies and programmes which further sustainable consumption and production and sustainable development. This report should be read in conjunction with the separate reports of the Secretary-General on waste management, chemicals, transport and mining, which are also before the Commission at its current session, as well as the report on trends in sustainable consumption and production, which provides a graphic picture of both the progress achieved and remaining challenges.

2. The report was prepared using information and data from countries' national reports submitted to the Commission, results of the regional implementation meetings and meetings of the Marrakech Process on Sustainable Consumption and Production, and analyses carried out by relevant major groups as well as other institutions and organizations that focus on sustainable consumption and production. The report has benefited from the contributions of the United Nations Environment Programme (UNEP) as well as inputs from other United Nations agencies.

## A. History and mandates

3. During the Rio de Janeiro Summit in 1992, the issue of "sustainable consumption and production" was elaborated in chapter 4 of Agenda 21.[2] Ten years later, at the World Summit on Sustainable Development in Johannesburg in 2002, all countries agreed that "Poverty eradication, changing unsustainable patterns of production and consumption and protecting and managing the natural resource base of economic and social development are overarching objectives of, and essential requirements for, sustainable development".[3] Specifically, in chapter III of the Plan of Implementation of the World Summit on Sustainable Development (Johannesburg Plan of Implementation), Member States and civil society were called upon to:

> Encourage and promote the development of a 10-year framework of programmes in support of regional and national initiatives to accelerate the shift towards sustainable consumption and production to promote social and economic development within the carrying capacity of ecosystems by addressing and, where appropriate, delinking economic growth and environmental degradation through improving efficiency and sustainability in the use of resources and production processes and reducing resource degradation, pollution and waste. All countries should take action, with

[1] See *Official Records of the Economic and Social Council, 2003, Supplement No. 9* (E/2003/29), chap. I, sect. A, draft resolution I, annex.

[2] *Report of the United Nations Conference on Environment and Development, Rio de Janeiro, 3-14 June 1992*, vol. I, *Resolutions Adopted by the Conference* (United Nations publication, Sales No. E.93.I.8 and corrigendum), resolution 1, annex II.

[3] *Report of the World Summit on Sustainable Development, Johannesburg, South Africa, 26 August-4 September 2002* (United Nations publication, Sales No. E.03.II.A.1 and corrigendum), chap. I, resolution 2, annex, Plan of Implementation of the World Summit on Sustainable Development ("Johannesburg Plan of Implementation"), para. 2.

developed countries taking the lead, taking into account the development needs and capabilities of developing countries, through mobilization, from all sources, of financial and technical assistance and capacity-building for developing countries.[4]

4. Progress in the thematic cluster of sustainable consumption and production patterns is a cross-cutting issue in the multi-year programme of work of the Commission, and as such has been reviewed in past sessions of the Commission in relation to specific thematic clusters.

5. Sustainable consumption and production is about how humanity produces an adequate supply of goods and services for everyone while putting less pressure on the environment and ecosystems. In short, it is about delinking economic and social well-being from environmental degradation. The Brundtland Commission clearly recognized the ultimate limits to the carrying capacity of the resource base and that "long before these are reached, the world must ensure equitable access to the constrained resource and reorient technological efforts to relieve the pressure".[5]

## B. New context

6. Over the past two years, the world has witnessed the emergence of multiple global crises, which have affected economic activity as well as social and economic goals (including the Millennium Development Goals) adversely. Enhanced volatility of energy and food prices, global food shortages and water scarcity have, most recently, been overshadowed by a global financial crisis. Adding to the complexity of the situation is climate change, which threatens to exacerbate the impact of other crises. These challenges, however, have provided opportunities to reshape investment and development patterns, to create new jobs in the "green economy", and to manage resources more sustainably, including through strengthened international cooperation and innovative business models.

7. The challenge of a 10-year framework of programmes is to ensure a quick transition to sustainable consumption and production patterns to remain within the carrying capacities of ecosystems while ensuring upward convergence in standards of living within and between countries. The objectives of the Framework are to advance economic and social development while at the same time quickly decoupling that process from environmental degradation and ecosystem destruction. Viewed differently, sustainable consumption and production seeks to identify and strengthen synergies between sound stewardship of the Earth's resources and improvements in the well-being of all humanity, especially of the poor.

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[4] Ibid., para. 15.

[5] United Nations, *Our Common Future*: Report of the World Commission on Environment and Development (1987), Chapter 2: Towards Sustainable Development (A/42/427, para. 10). The Club of Rome 1972 Report, *Limits to Growth*, made a similar argument regarding the use of non-renewable materials in a finite world, though the timeline proved to be too pessimistic.

# II. Review of progress

## A. Global consumption of resources

8. The global population has more than quadrupled since the beginning of the twentieth century, and global GDP increased 23-fold, resulting in a 5.5-fold increase in income per capita. However, income gains have been very unequally distributed and a culture of "consumerism" has developed among higher income groups.[6] The 20 per cent of the population in the highest-income countries accounted for 77 per cent of total private consumption in 2005, while the poorest 20 accounted for only 1.3 per cent.[7]

9. A number of methodologies have emerged in recent years for assessing the relationship between final consumption and material use. These include life-cycle analysis (which traces material consumption throughout a product's life cycle), footprint analysis (which converts consumption into an area-based numeraire), and material flow analysis (which aggregates material consumption by tons of four basic categories — metals, minerals, fossil fuels and biomass). Material flow analysis is the least invasive methodology, since it is based on official data and does not make any assumptions with regard to environmental impacts or relative carrying capacity. Still, it provides a useful tool to assess whether there has been a significant decoupling of global resource use from economic and population growth.[8]

10. In line with the growth of population, income and output, global material use (both aggregate and per capita) as well as total primary energy supply (TPES) have been increasing since 1900, with marked increases since 1960 (see figure 1). Total material consumption (metals, industrial and construction minerals, fossil fuels and biomass) has increased almost eightfold from 7.5 billion tons in 1900 to 59 billion tons in 2005.[9] This is about double the increase in population, but only 40 per cent of the increase in global GDP. However, the pace of material use has increased since 2000 and extraction of iron ore, bauxite, copper and nickel is now rising faster than the world GDP.[10] For the first time, these increases in resources used per capita are driven by emerging economies.

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[6] World Business Council for Sustainable Development, "Sustainable Consumption Facts and Trends from a Business Perspective: The Business Role Focus Area" (Geneva, Switzerland, 2008).

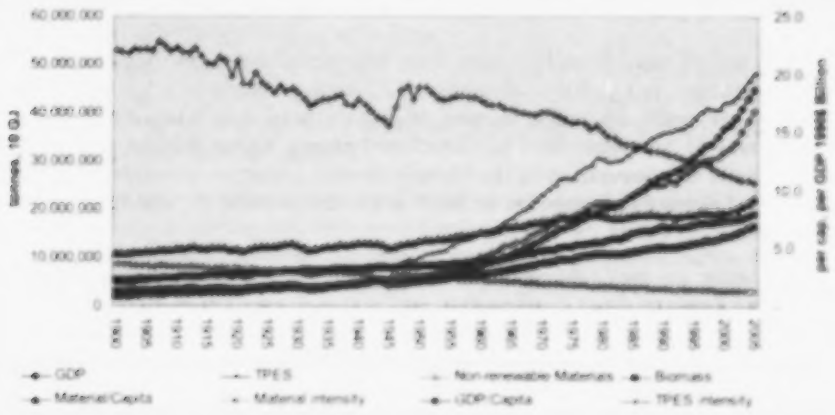
[7] http://www.globalissues.org/issue/235/consumption-and-consumerism (accessed 27 January 2010).

[8] The data for these analyses is available through the European Union-supported online Portal for Material Flows. Available from http://www.materialflows.net/.

[9] F. Krausmann, S. Gingrich, N. Eisenmenger, K-H. Erb, H. Haber and M. Fischer-Kowalski, "Growth in global materials use, GDP and population during the 20th century", *Ecological Economics*, vol. 68, issue 10 (2009), pp. 2696-2705.

[10] T. Jackson, "Prosperity without Growth? — the transition to a sustainable economy" (United Kingdom, Sustainable Development Commission, 2009).

Figure 1
**Long-term trends in resource and energy use intensity**




*Source*: Derived from Krausmann et al., 2009.

11. Notably, while there was some decline in resource use per unit of GDP (relative decoupling), it was outweighed by the increase in GDP, and thus resulted in increased absolute use of material and energy — the so-called rebound effect. In fact, material consumption has increased at an average of 2 per cent per year. This has been especially evident in home heating or cooling devices and personal transportation.[11] There is no evidence of global absolute decoupling.

12. At a country level, some economies, mainly industrialized, have seen relative decoupling of both resource use and environmental impacts from economic growth (see box 1). In a few instances there has even been absolute decoupling. While structural factors (especially the growing share of services in more affluent economies) are a main driver of relative decoupling, transformational policies, including the setting of ambitious national targets (as done by Denmark and Costa Rica), would be needed to achieve absolute decoupling. Besides countries, some companies have also adopted decoupling targets, e.g., for carbon (Timberland), water neutrality (Coca Cola Enterprises), and closed loop/zero waste (Dupont, Toyota).

[11] See footnote 5.

Box 1

**What is decoupling?**

Decoupling refers to the relationship between (a) economic and social variables, such as GDP or the Human Development Index, and (b) environmental variables, such as resource use or environmental degradation. It is important to distinguish between resource decoupling — progressively reducing the material inputs needed to produce additional units of output — and impact decoupling — reducing the adverse environmental consequences between relative and absolute decoupling and between renewable and non-renewable resources.

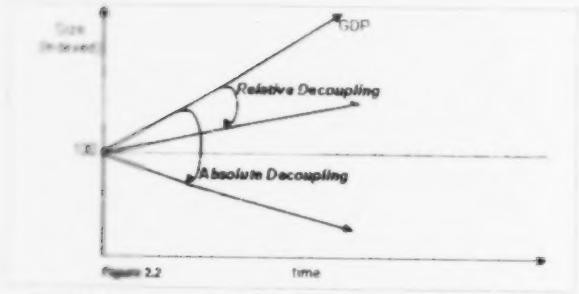



Figure 2.2 Stylized representation of the distinction between "absolute" and "relative" decoupling

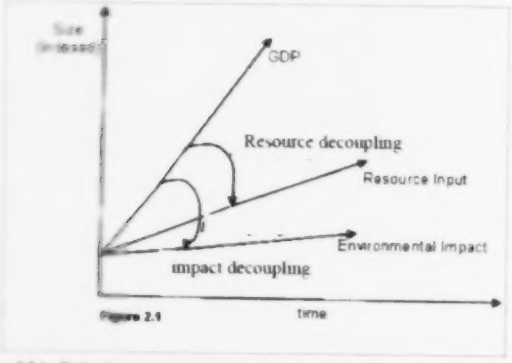



Figure 2.1 Stylized representation of the distinction between "Resource" and "Impact" decoupling

Source: T. Jackson, 2009.

13. Regional differences in material use are driven by differences in lifestyle, affluence, population, geography and technological sophistication. North America's per capita material consumption is 3 times, and Western Europe's is 1.6 times, the world average (using ecological footprint measures; see below). Before the past two

decades, material use in developing countries with biomass-based economies had been driven mainly by population growth. However, this is changing as urban populations grow rapidly and emerging countries develop and industrialize. From 1900 to 2000, the number of city dwellers rose from 220 million to 2.8 billion, a tenfold increase,[12] reflected in a thirty-fourfold increase in construction minerals and a twenty-sevenfold increase in ores and industrial minerals. Over the past century, developing country populations increased sixfold while they tripled in industrialized nations; now 85 per cent of the population lives in developing countries.[13] Yet, with only 15 per cent of the population, industrialized nations use 50 per cent of the fossil energy, industrial minerals and metallic ores, though this is slowly changing.

## B. Role of technology

14. Advances in technology have provided opportunities to accelerate development (e.g., green jobs, new market opportunities) and increase eco-efficiency, but they also present downsides and risks. The rapid growth and increasing convergence between information and communications technologies (ICT) have enabled innovative business and service delivery models for development — the classic example being the "village phone" innovation from Grameen Bank. However, the ICT revolution has also produced new material flows of hazardous and other hard-to-treat material, posing significant sustainability challenges. The volumes of second-hand electronics products and e-waste that are exported to developing countries, where metal recovery takes place without formal treatment facilities, pose important health and environmental challenges.

15. Biotechnology and nanotechnology are seen as carriers of enormous transformative potential but also with unknown risks. The opportunities as well as risks are at an early stage of development, although moving quickly. It will be prudent to ensure from the outset that they are deployed in ways that mitigate the risks and reduce resource and energy use (see box 3), for example, through product review processes that ensure sustainability requirements before introduction to the market.

16. The rapid growth in world trade globalization of supply chains has magnified both the challenges and opportunities of sustainable consumption and production. A number of developing countries have emerged as major production centres, thus creating economic opportunities for sustainable development.[14] This trend has also enabled the rapid diffusion of environmentally sustainable technologies from advanced to developing countries. International cooperation under the auspices of multilateral environmental agreements has contributed to this diffusion. The Montreal Protocol has shown how quickly ozone-friendly technologies could be introduced. But a framework needs to be in place to support technology diffusion

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[12] United Nations Population Fund, "State of World Population 2007: Unleashing the Potential of Urban Growth" (New York, 2007). See http://www.unfpa.org/swp/2007/english/chapter_4/index.html.

[13] Industrialized = members of the Organization for Economic Cooperation and Development (OECD), other Eastern European countries and the Russian Federation, Krausmann et al., 2009.

[14] G. Peters and E. G. Hertwich, "Pollution Embodied in Trade: The Norwegian Case", *Global Environmental Change*, vol. 16, issue 4 (2006), pp. 379-387.

and transfer and to build capacity in developing countries where needed to utilize environmentally sound technologies.

17. However, the globalization of production makes it difficult to estimate national or regional resource intensities, since consumers in developed countries are increasingly importing resource-intensive products from developing countries. Hence, a reduction in the resource use in the former is partly explained by a transfer of resource-intensive activities to the latter. For instance, in the case of greenhouse gas emissions, if $CO_2$ embodied in trade were included in the United Kingdom inventory, $CO_2$ emissions would have risen by 11 per cent between 1990 and 2005 instead of the nationally reported decline of 6 per cent.[14] Twenty-seven countries have an external water footprint (water used in goods they import) that accounts for more than 50 per cent of their total water consumption.[15] It also means that the resulting environmental impacts and resource use are increasingly embodied in trade[16] and are increasing over time. The World Economic Forum estimates that one third of China's emissions are due to exports.[17]

18. The challenge of exhaustion of non-renewable resources, together with the recent rise and heightened volatility of commodity prices, is essentially a global one. There is a need to find internationally agreed solutions on measuring and equitably allocating reduction targets of embodied resource use and pollution, including materials, water and $CO_2$, and in ensuring that clean technologies and innovative business models are available to achieve these targets. Solutions should also aim to reduce risks and increase the resilience of communities and economic and trade systems.

## C. Staying within ecosystems' carrying capacities

19. Various efforts have aimed to assess whether economies operate within the carrying capacity of ecosystems. Global and multidisciplinary efforts, such as the Millennium Ecosystem Assessment and the International Assessment of Agricultural Knowledge, Science and Technology for Development, have assessed the health of the Earth's biodiversity and agroecological zones, and other environmental services. Together they find that human activity is putting such a strain on the Earth's ecosystems that 60 per cent of the ecosystem services are being degraded or unsustainably used, and the ability to sustain future generations is being jeopardized. Land degradation affects 1.9 billion hectares (and 2.6 billion people) and irrigated agriculture uses 70 per cent of freshwater withdrawal globally. As water and land scarcity increases, often compounded by climate change, business-

[15] The World Wildlife Federation water footprint — volume of water used to produce the goods and services consumed in a country — includes water use from both domestic and external (water used in producing the goods in the exporting country) sources. Worldwide, external water use accounts for 16 per cent of the water footprint. For 27 countries, more than 50 per cent of their water footprint is external.

[16] For instance, "embodied carbon" refers to carbon dioxide emitted at all stages of a goods' manufacturing process, from the mining of raw materials through the distribution process, to the final product provided to the consumer. J. Kejun, A. Cosbey and D. Murphy, "Embodied Carbon in Traded Goods" (International Institute for Sustainable Development, Winnipeg, Canada, 2008).

[17] World Economic Forum and Deloitte, Touche, Tohmatsu, "Sustainability for Tomorrow's Consumer: The Business Case for Sustainability" (Geneva, Switzerland, 2009).

as-usual agricultural practices will not be enough to meet the projected 75 per cent increase in global cereal and doubling in meat demand between 2000 and 2050.

20. Other efforts led by the Ecological Footprint Network have focused on designing country-level and Global Ecological Footprint as well as ecological capacity. The Network finds that, globally, economies exceed the planet's capacity by 33 per cent. The World Wildlife Federation water footprint measures the proportion of a country's ecological footprint that is covered by national versus other countries' biocapacity through imports. No single measure of world water supply is available. But countries exceeding their biocapacity have gone from none in 1960 to 24 at present (including in North America, the European Union, the Middle East and Asia-Pacific regions).

21. These findings are supported by a prominent recent scientific article that defines nine Earth biophysical services and carrying capacity for each that should not be exceeded to ensure stability.[18] Three — the rate of biodiversity loss, interference with the nitrogen cycle and climate change — have already exceeded their carrying capacity. Another four — global freshwater use, change in land use, ocean acidification and interference with the global phosphorous cycle — are getting close to their thresholds. Though there are scientific differences on how some of these trends should be measured, there is considerable support for the central message, that global consumption is using resources (increasingly non-renewable) faster than the planet can regenerate them, and using them in ways that produce more and faster damage than many natural systems can absorb.

# III. Enabling policy framework to transition to sustainable consumption and production

22. All actors have a role to play in changing consumption and production patterns. However, Governments need to provide a policy framework that gives clear signals and information to both producers and consumers, and support them with effective, open and transparent legal and administrative structures.

23. From land use planning to building codes, to trade, fiscal and other economic and social policies, including regulatory, procurement as well as economic instruments, Governments have the capacity to shape market conditions towards the adoption of sustainable consumption and production. Failure to internalize environmental and other externalities often provides incentives for unsustainable behaviour.

## A. No silver bullets — framework of actions needed

24. A shift to sustainable consumption and production requires a mix of policies, regulations, regional and international cooperation and long-term vision and planning. In order to begin the process of policy design, incentive structures and awareness-building, Governments had agreed in Johannesburg to develop a 10-year

[18] J. Rockstrom et al., *Nature*, vol. 461, pp. 472-475 (September 2009). See http://www.nature.com/nature/journal/v461/n7263/full/461472a.html (accessed 23 September 2009).

framework of programmes and followed it up with the Marrakech Process to identify and implement concrete programmes and projects, based on collaboration and partnerships, through consultations, national round tables and task forces (see box 2).

Box 2
**What is the Marrakech Process?**

The Marrakech Process is a global multi-stakeholder process to promote sustainable consumption and production and work towards a 10-year framework of programmes on sustainable consumption and production. Led by the United Nations Department of Economic and Social Affairs and UNEP, this process has developed and expanded networks and communities of practice at national, regional (e.g., African Round Table on Sustainable Consumption and Production, Latin American Regional Council on Sustainable Consumption and Production) and international levels (e.g., seven task forces) with the active participation of Governments, major groups and other stakeholders. The Process provides examples of best practices, policies and sustainable consumption and production analytical tools, as well as the types of institutions, partnerships and projects that can help to implement sustainable consumption and production in practice. It has supported the development of regional strategies, pilot projects and capacity-building activities and North-South cooperation, and promoted knowledge-sharing through regional institutions and regional and international meetings as well as websites.

The Marrakech task forces are voluntary initiatives led by Governments focusing on seven specific themes: (a) "Education for sustainable consumption", (b) "Sustainable tourism", (c) "Sustainable public procurement", (d) "Sustainable products", (e) "Sustainable buildings and construction", (f) "Cooperation with Africa" and (g) "Sustainable lifestyles".

For more information, see www.unep.fr/scp/marrakech and www.desa.org/marrakech.

**Regional activities**

25. Partly in response to the Johannesburg Plan of Implementation and to the Marrakech Process, the European Commission has put forward a sustainable consumption and production and sustainable industrial policy, an action plan that includes a range of activities such as promotion of eco-design, green public procurement, labelling, boosting resource efficiency and lean production.

26. The African region has developed a regional 10-year framework of programmes on sustainable consumption and production with energy, water and sanitation, habitat and sustainable urban development, and renewable resource-based industrial development as priorities. With the support of the Marrakech

Process Task Force on Cooperation with Africa, implementation has started through nine projects.

27. The Asia-Pacific region has opted for a green-growth strategy based on greening of business and markets, building sustainable infrastructure, green tax and budget reform, investment in natural capital, and eco-efficiency through cleaner production. Policies and strategies to support these include: economic instruments, eco-tax reform, green procurement, public information disclosure, and product stewardship tools.[19]

28. The Latin American and Caribbean region has launched its regional Sustainable Consumption and Production Strategy supported by the Marrakech Process and set up a Council of Government Experts on Sustainable Consumption and Production. The regional strategy established five sustainable consumption and production priorities: (a) national sustainable consumption and production policies and strategies, (b) sustainable consumption and production in small and medium enterprises, (c) sustainable public procurement, (d) sustainable lifestyles and (e) information and knowledge management networks.[20] These priorities were confirmed at the regional implementation meeting, while incorporation of sustainability in the construction sector was added.

29. The Arab region has developed the Arab Regional Strategy for Sustainable Consumption and Production,[21] where six sustainable consumption and production priorities were identified: (a) energy for sustainable development, (b) water and waste management, (c) rural development and poverty alleviation, (d) education, (e) sustainable lifestyles and (f) sustainable tourism. Draft regional implementation programmes for the Strategy were also identified during the regional implementation meeting and approved by the Council of Arab Ministers Responsible for the Environment.

**Sustainable consumption and production at the national level**

30. More than 30 countries (including the Czech Republic, Finland, the United Kingdom of Great Britain and Northern Ireland, Ethiopia, Senegal, Argentina, Jamaica and Thailand) have now developed or are developing national programmes on sustainable consumption and production.[22] Some other countries have prioritized the development of national sustainable consumption and production programmes or action plans,[23] while others have started putting in place activities, policies and programmes without necessarily a national framework.[24] To support these developments, the Marrakech Process has developed Guidelines and used them in

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[19] United Nations, Economic and Social Commission for Asia and the Pacific, *Green Growth at a Glance: The Way Forward for Asia and the Pacific* (Environment and Sustainable Development Division, Bangkok, 2006).

[20] Fifth Meeting of the Council of Government Experts of Latin America and the Caribbean for Sustainable Consumption and Production, Cartagena, Colombia, September 2009.

[21] A collaborative document by UNEP, the League of Arab States and the Economic and Social Commission for Western Asia.

[22] The UNEP Clearinghouse for National SCP Programmes provides information on existing and in-development SCP programmes (UNEP, Report on National SCP Programmes, March 2007).

[23] Second International Expert Meeting on the 10-Year Framework of Programmes, Costa Rica, September 2005. Marrakech Process. See www.unep.fr/marrakech.

[24] Arab Regional Strategy for Sustainable Consumption and Production, 2009.

several demonstration projects as well as in awareness- and capacity-building activities.

31. A few countries have identified specific sustainable consumption and production targets. Germany, Austria and Denmark have resource decoupling targets. Germany aims to double its energy and raw material efficiency compared to 1990[25] and in the long term to reduce resource consumption absolutely by 50 per cent. Denmark aims to limit long-term resource consumption to 25 per cent of the current level. Austria aims for stabilization of absolute resource consumption in the short run and a fourfold increase in resource efficiency in the long run. Other countries have energy efficiency and renewable energy targets. China has a national renewable energy goal of 15 per cent by 2020, and 4 per cent annual improvements in energy efficiency. New Zealand has a renewable energy target of 90 per cent by 2025. Brazil aims to avoid 6,400 MW in additional capacity through energy efficiency by 2030. Mexico aims to reach a 26 per cent renewable energy target by 2012 and a halving of carbon by 2050. Several countries have pledged carbon neutrality — the Maldives by 2020, Costa Rica by 2021, Norway by 2030 and Sweden by 2050. California has a target of 33 per cent renewable energy and reduction of 20 per cent in per capita water use by 2020 as well as zero net energy use for all new residential buildings by 2020 and commercial buildings by 2030. At the city level, 1,016 mayors have joined the United States Conference of Mayors' Climate Protection Agreement, vowing to reduce carbon emissions in their cities below 1990 levels, in line with the Kyoto Protocol. Decoupling utilities' revenues from actual energy sales by ensuring fixed utilities' revenues, as was done in California, allows utilities to pursue demand-side management and increase energy efficiency.

**Sectoral approaches to implement sustainable consumption and production**

32. Various regions and countries have focused action on high-impact sectors with the highest resource use and pollution. For instance, research has indicated that food and drinks have the highest levels of ecological impact per dollar spent, followed by household electrical equipment and housing. In absolute terms, food, private transport and housing have the most significant impacts.[26]

**Green stimulus packages**

33. Some economic stimulus measures in response to the global financial crisis and economic downturn were also aimed at advancing sustainable consumption and production. Although it is too early to assess their impact,[27] the broad range of these measures (including transport and water infrastructure spending in China, energy efficiency in buildings in Mexico and France, and public transport spending in the Republic of Korea)[28] is instructive. These investments could contribute to positive

[25] Sustainable Europe Research Institute (SERI), Online Portal for Material Flow Data. See www.materialflows.net/ (accessed 10 September 2009).

[26] World Business Council for Sustainable Development, 2008, and European Environment Agency.

[27] Based on estimates of HSBC Global Research; these concentrate on climate change investment themes, and thus account for a large portion of investments that contribute to the shift to the green economy. Source: N. Robins, R. Clover and C. Singh, "A Global Green Recovery? Yes, but in 2010" (HSBC Global Research, London, August 2009).

[28] http://www.unep.org/pdf/G20_policy_brief_Final.pdf.

changes and yield important lessons. They are part of a new movement for a green economy that calls for increased resource efficiency, decoupling economic growth from environmental degradation, and creating decent green jobs.

## B. Business innovation for sustainable consumption and production

34. From sole traders in informal markets to global corporations, businesses are key agents in production and consumption. Sustainable consumption and production thinking needs to become "business as usual" in decisions about finance and insurance, product development, innovation, production and delivery that increasingly focus on offering services as opposed to products. So far most Governments have relied on voluntary measures, which are not sufficient in themselves. Complementary regulatory and market-based measures that create the necessary incentives to change the core business model and align resource use and resource costs are also necessary. For instance, the European Union extended producer responsibility regulation, although focused on the end of life, has impacted across the life cycle, making recyclability and ease of disassembly an essential part of the design brief for cars and electronic equipment. The World Economic Forum finds that the cost of water around the globe is negligible compared to other inputs, and thus water is rarely seen as a priority when business attempts to reduce production costs.[29] Unless resources prices reflect their scarcity, incentives to reduce their use in production are limited.

35. The World Business Council for Sustainable Development proposes three roles for business in mainstreaming sustainable consumption: (a) innovation, (b) choice influencing and (c) choice editing.[30] All three roles pertain, in one way or another, to the governance of the commodity chain, especially through the embedding of sustainability principles into the core business model. For instance, life-cycle analysis of cars and electronics demonstrates that the largest environmental impact occurs during the use phase of the products as opposed to the manufacturing phase. That underlines the need for major innovation in design (eco-efficiency, design for environment) to develop improved products that use fewer resources during the consumption phase. Business can use marketing and communication and awareness-raising campaigns, especially in partnership with non-governmental organizations and other third parties, to encourage the use of more sustainable products and services. Business can also remove unsustainable products and components from the marketplace. Of course, this has to be done in partnership with other actors in society, including competitors, and may require international cooperation.[30] For instance, "radical collaboration" where alliances between former competitors are created to solve problems together could be applied to the sustainability movement.

36. "Choice editing" by retailers refers to the imposition of standards on purchases e.g., when businesses eliminate certain compounds from their supply chains (as Wal-Mart did with seven hazardous chemicals). This can be a powerful tool, but care is needed to avoid anti-competitive consequences where only larger suppliers are able to deal with assurance procedures. However, supply chain management is both a powerful lever and a good example of a technique developed

[29] See footnote 17.
[30] See footnote 6.

for other purposes that is increasingly being used to green the supply chain and can be further improved to support sustainable consumption and production.

## IV. Role of civil society and consumers

37. Civil society organizations and the academic community have played an important role on sustainable consumption and production in raising awareness, developing tools (such as life-cycle analysis and footprinting), facilitating consumer-led initiatives or certification programmes (e.g., by Forest and Marine Stewardship Councils or on Fair Trade), and participating local actions and practical solutions.

38. Certification and labelling: sustainable consumption and production patterns are complex and particular to products, time and place, making it difficult to develop simple certification systems. There is now enough experience with different tools, ranging from disclosure of narrowly focused factual information (e.g., energy efficiency) to processes that involve voluntary third-party certification of compliance with comprehensive sustainability criteria. Lessons have been learned on balancing rigour and credibility with administrative burdens of certification and assurance. In some cases the value of certification has been less in the influence on the final consumer than in action to deal with problems exposed by certification procedures such as poor labour practices of subcontractors. In designing consumer information tools, there is a tension between comprehensive multi-attribute coverage and the desire to have rapid and broad-base impact on a scale to make a difference. Consumer International identified concerns that the number and range of labels is confusing consumers, thus reducing their effectiveness.

39. There are now a few global initiatives aiming at harnessing the growing ICT capacity to make transparency in products and suppliers the norm instead of the exception achieved by past certification schemes. These initiatives such as People 4 Earth and Wal-Mart's Live Better Index bring together Governments, the private sector and non-governmental organizations to reduce the confusion faced by consumers in exercising sustainable consumption choices. By setting core social, environmental and equity standards to be met, and progressively higher standards to be recognized and rewarded, these groups contribute to the progressive mainstreaming of sustainable consumption. Critical to such efforts will be institutional and technical support to building capacity of suppliers, especially small-scale ones, in developing countries to achieve core standards and to make continuous improvements.

Box 3
**Biotechnology for sustainable products**

Increasingly, both NGOs and the private sector recognize the value of partnership and increased transparency. Novozymes — a manufacturer of bioengineered enzymes — has opened its books to the World Wildlife Fund to explore, using Life Cycle Analysis, the greenhouse gas mitigation potential of industrial biotechnology. The resultant report concludes that industrial biotechnology has huge climate change mitigation potential, but what is even more important is that the report lays out a scenario of economies independent of fossil fuels and waste. Central to this is the use of biotech-based enzymes in the food and fuel industry to improve efficiency, as well as in products like detergents which do not require hot water. Bio-based materials can be used, including from recycled waste, to substitute for everyday products made from crude oil. This scenario is conditional on a strong and effective system of sustainable international policies and standards.

# V. Policies and measures to transition to sustainable consumption and production

40. No single policy is likely to change unsustainable patterns of consumption and production. Yet, except for a few countries reviewed above, most countries still have no integrated framework and instead have policies, actions and programmes that address aspects of consumption or production individually.

## A. Sustainable consumption

41. Despite clear evidence from market studies that awareness of environmental and social issues is entering the mainstream, many impediments remain. Currently approximately 15 per cent of Western consumers claim to take environmental and social issues into account in their consumption decisions. Yet, given that the market share of sustainable food, furniture, buildings, home and personal care products remains at about 1 per cent or less,[31] only a fraction of the societally conscientious consumers actually translate their concerns into purchases. The reasons include: (a) difficulty of access; (b) product performance (perceived or real); (c) the absence of easily understandable, multi-attribute and trustable labels; (d) price premiums perceived (at times rightly) as unaffordable for most people; and (e) force of habit.

42. There are three pathways by which sustainable consumption can be accelerated: (a) redesigning products, (b) shifting from consumption of products to services and (c) more conscious consumption.[32] Products can be redesigned so they are cleaner and safer and use energy more efficiently. Products can be made in

[31] A. White, "Consumption, Commerce and Citizenship: Values Transformation to Build a Sustainable World" (Washington, D.C., People 4 Earth, 2009).

[32] See footnote 5.

companies which pay fair wages to employees working in healthy workplaces and which treat animals humanely. Moving from a model of profitability based on selling products to one based on providing functionality-oriented services can enhance sustainability. Ways can often be found to deliver the services that customers want in ways which are less resource-intensive. Many argue, however, that a major shift from conspicuous to "conscious" consumption is needed to place economies on a sustainable path. This can be achieved through education and awareness-raising and by tools that provide consumers with on-the-spot, transparent and reliable information about products and producers.

**Information and education**

43. Sustainable consumption is still widely misperceived as "consuming less" rather than "consuming better" and making informed choices. Reorienting consumer preferences and purchasing decisions requires adequate and reliable information as well as education on environmental, economic and social issues. Mexico, Japan, Norway, Mauritius, Portugal and South Africa have introduced environment and sustainable development (sustainable consumption being a core component of sustainable development) into their curricula and teacher training as well as into wider public education programmes/campaigns.

44. Several tools are available to assist the integration of sustainable consumption into education. These include the UNEP/United Nations Educational, Scientific and Cultural Organization (UNESCO) Youth Xchange Guidebook, the Guidelines on Education for Sustainable Consumption "Here and Now!",[33] initiatives from civil society organizations (such as the Consumer Citizenship Network and the Center for Environmental Education), and such teacher training initiatives as the UNESCO "Guidelines and Recommendations for Reorienting Teacher Education to Address Sustainability" at the global level, or the Portuguese "Guide to Consumer Education" at the national level. Several surveys have tried to poll public opinion on sustainability issues; mention must be made of the 2009 Global Survey led by the Marrakech Task Force on Sustainable Lifestyles on how young adults perceive, imagine and shape sustainable lifestyles. Preliminary results show the higher receptivity among young adults of innovative solutions.

45. Growth in civic entrepreneurship has also contributed by challenging existing institutions and advancing alternative models for action by Governments, businesses and civic leaders, and seeking to translate expanded awareness into behavioural change.

46. Sustainability educating involves not simply information on "dematerialization" of consumption or an emphasis on services but also reducing negative environmental, social and cultural impacts of services themselves, e.g., tourism. The Marrakech Task Force on Sustainable Tourism Development has surveyed best practices and launched campaigns such as the Internet-based Green Passport campaign,[34] showcasing practical ways to protect the natural and cultural heritage. The development and dissemination of training manuals and e-learning tools focus on the main stakeholders of the tourism value chain.

[33] "Here and Now! Education for sustainable consumption" (UNEP and the Marrakech Task Force on Education for Sustainable Consumption, 2008). See www.unep.fr/scp/marrakech/taskforces/education.htm.

[34] International Task Force on Sustainable Tourism. See http://www.unep.fr/greenpassport.

**Sustainable public procurement**

47. When Governments make a concerted effort to purchase sustainable products and services, in addition to leading by example, their substantial buying power has the potential to create and drive markets for sustainable products both nationally and internationally.[35] Governments are the largest consumers in an economy. On average, total public expenditures by central and local Governments (including investment expenditures) are estimated to account for about 20 per cent of GDP in OECD countries, and roughly 15 per cent in non-OECD countries.[36] This is especially so in sectors such as defence, health and research, construction, energy and transport equipment sectors where the government is one of the largest customers. Creating economies of scale, the government purchase can lower the costs of clean technologies, making environment-friendly products more affordable to the entire population.

48. A well-documented success story is the market transformation in the United States following a 1993 Executive Order which required that the Federal Government purchase only Energy Star computer equipment. The Government of the United States being the largest purchaser of computers worldwide, the Executive Order led to a complete market transformation, and by the end of the 1990s, Energy Star computer equipment dominated the market.

49. Sustainable public procurement is gaining ground in both developed and developing countries. The process has been speeded up because of the work of the Marrakech Process Task Force on Sustainable Public Procurement. The Task Force has made available an online assessment tool and training materials for different stakeholders in the public procurement process and provided capacity-building training to several countries through an EU, Switzerland and Francophonie partnership.

50. International organizations like the United Nations and the Bretton Woods institutions themselves are major consumers of certain goods and services and have global operations with significant social and environmental impacts. Since 2007, the United Nations has adopted a strategy to move towards climate neutrality and sustainable management systems in all its programmes, funds and specialized agencies. This work is captured under the United Nations Climate Neutral Strategy facilitated by the inter-agency Environment Management Group.

**Price signals**

51. Although the Polluter Pays Principle has been given legal force in environmental legislation in many countries, environmental services from the atmosphere, soil and water are still mainly regarded as part of the global commons of "free goods" that are not priced and the costs of damage to the environment and society are still not integrated into production costs and prices. Until more progress is made in effectively applying the Principle, price signals will continue to fail to indicate relative scarcity of public goods and to provide incentives for consumers to choose sustainable options.

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[35] United Nations, Department of Economic and Social Affairs, "Public procurement as a tool for promoting more sustainable consumption and production patterns", Sustainable Development Innovation Briefs, Issue 5 (August 2008).

[36] See footnote 10.

52. To varying degrees many countries have espoused ecological tax reform, but technical, administrative and, not least, political difficulties have prevented major change. Denmark and Sweden have enacted (and the Scottish Parliament has voted) major tax reforms that reduce taxes on income while increasing taxes on polluting activities. Similar tax shifts are being discussed at local levels in the Canadian city of Winnipeg and the province of Ontario. At the local level, property taxes have been shifted from buildings to land to encourage denser development and discourage sprawl.

## B. Sustainable production

53. The last two decades have been a time of unprecedented expansion of the global economy. One feature has been the inexorable rise in the proportion of manufacturing output that is internationally traded, with international trade in manufactured goods growing from 32.5 to 41.5 per cent of world GDP between 1990 and 2003.[37] Despite some progress towards improved materials and energy efficiency in production processes, the global economy is still producing more and more products with shorter lives, using more physical resources. But recent increases in commodity prices and growing concerns related to waste may be a sign of increasing pressure to conserve material inputs and energy. With material and energy input prices expected to continue to rise as soon as the global recession is over, eco-efficiency opportunities become more attractive.

54. The growth in world trade and in global supply chains and networks has magnified both the challenges and opportunities of sustainable consumption and production. While economic development has brought many millions out of poverty, the lifestyles to which many aspire, and which globalization has enabled increasing numbers around the world to enjoy, are not sustainable on a business-as-usual basis. Moreover, globalization has also magnified gaps between rich and poor, within and between countries and regions, with consequent social and political impacts and tensions, for example, related to migration.

55. The growth of trade in manufacturing has been accompanied by a relocation of production of many manufactured goods from developed to developing and transition economies. The production process is increasingly broken down into tasks and subprocesses which are linked through trade in components, assemblies and subsystems. As a result, manufacturing is becoming less vertically integrated and the old image of raw materials entering at one end of a huge factory and coming out at the other end as a final product is less and less applicable.

56. The inability of companies to identify the sources of material inputs and components, no less determine the sustainability of suppliers' practices, has convinced some manufacturers and retailers to expand the scope of their responsibilities up their supply chains. They have taken a direct and positive interest in strengthening weak links in that chain. The promotion of sustainable production requires a systematic and coordinated effort to influence business practices across

[37] UNIDO, *Industrial Development Report 2009. Breaking in and Moving Up: New Industrial Challenges for the Bottom Billion and the Middle-income Countries*, ISBN: 978-92-1-106445-2 (UNIDO, Vienna, 2009).

global supply chain networks and to build the capacities in developing and transition economies to industrialize on a sustainable basis.

57. Over the last few decades, significant progress has been made on improving understanding of the adverse environmental and social impacts of industrial production processes and in the development of tools and techniques to improve resource efficiency (for example, making metal and glass food and beverage containers stronger but lighter, and facilitating recycling by designing motor vehicles in ways that make disassembly easier) and reduce environmental impacts (for example, replacing solvent-based paints and adhesives with water-based and other alternatives). Certification requiring Life Cycle Analysis has been instrumental in facilitating resource-efficient, cleaner production and decent work conditions, but more needs to be done to make sustainable production the norm across all sectors and countries. Key to this transition is consistent and transparent government policies and guidance, the active involvement and leadership of multinational corporations in promoting sustainable production practices along their global supply chains, and monitoring and oversight by civil society and academia. Public-private partnerships can play a vital role in supporting small and medium enterprises to meet more demanding standards. Strengthening the existing engagement of the United Nations family with global businesses through mechanisms such as the United Nations Global Compact and through technical cooperation programmes such as those of the United Nations Industrial Development Organization (UNIDO) can help in this regard.

58. Certification schemes have also helped to encourage progress on reducing the resource and pollution intensity of products as well as enhancing positive social impacts in developing countries. Fair Trade-certified goods such as coffee, tea, bananas, handicrafts, sugar, cocoa, wine and honey guarantee a minimum, higher than market price to producers by eliminating middlemen. In 2008, Fair Trade-certified sales amounted to approximately US$ 4.08 billion worldwide, a 22 per cent year-to-year increase. Fair Trade products generally account for 1 to 20 per cent of all sales in their product categories in Europe and North America. In June 2008, it was estimated that over 7.5 million producers and their families were benefiting from Fair Trade-funded infrastructure, technical assistance and community development projects. These projects are valuable because, among other things, they provide capacity-building to producers (mainly small producers) so they can meet the best practices required for certification. Yet at present only a tiny proportion of producers are reached, so programmes to scale up the transfer of best practices and to ensure decent jobs and prices could be more broadly spread.

59. Competitive markets can provide powerful levers for changing production patterns but, on the other hand, competitiveness concerns are a frequent obstacle, inhibiting collaboration between rivals in improving standards. Also, voluntary and other standards increasingly risk becoming barriers to trade for developing countries, especially for small and medium enterprises. Aid for Trade[10] and other programmes have started providing capacity-building to ensure that the private sector can meet these new standards, and the EU offers a web-based Export

[10] Aid for Trade aims to help developing countries, particularly least developed countries, develop the trade-related skills and infrastructure that is needed to implement and benefit from World Trade Organization agreements and to expand their trade. See http://www.wto.org/english/tratop_e/devel_e/a4t_e/aid4trade_e.htm.

Helpdesk to provide advice and information to developing countries.[39] But more needs to be done. The resource-efficient and Cleaner Production Programme of National Cleaner Production Centres established in developing countries by UNEP and UNIDO has been developed to scale up technical support and capacity-building. This network of centres now covers 42 developing and transition economies.

60. A 2007/2008 evaluation of the UNIDO-UNEP Cleaner Production Programme[40] confirmed sustained success in the building up of and strengthening of local institutions to provide services that have achieved uptake of Cleaner Production by enterprises, government institutions and other organizations. The evaluation concluded that in terms of institution-building and strengthening this approach has been appropriate for the situation in most developing and transitional countries. But it also suggests a number of improvements, including building and maintaining a network of expert institutions to allow programme management to draw on available expertise and promote North-South and South-South cooperation.

## VI. Continuing challenges and obstacles

61. The goal for the eighteenth session of the Commission on Sustainable Development is to identify challenges and obstacles that hinder the move towards sustainable patterns of consumption and production, and that of the nineteenth session is for the international community to agree on a framework of programmes in support of sustainable consumption and production. Together, the eighteenth and nineteenth sessions of the Commission offer the opportunity to learn from recent experience, create awareness of long-term sustainability and equity considerations, and build a coherent programme (the 10-year framework of programmes) to address sustainability challenges:

- Institutionalizing sustainable consumption and production concerns into education systems as well as systems of local, national, corporate and international governance
- Identifying priority actions and initiatives at different levels
- Support peer-to-peer learning
- Mobilizing support for scaling up successful initiatives and programmes
- Encouraging economic and financial policies and public and private investments which promote sustainability
- Providing an enabling environment for and supporting research, innovation and development in critical areas.

[39] http://exporthelp.europa.eu/display.cfm?page=intro/intro_Welcome.html&docType=main&languageId=EN.

[40] UNIDO and UNEP, Independent Evaluation of the UNIDO-UNEP Cleaner Production Programme (UNIDO, Vienna, 2008).

62. Guiding objectives for such a programme remain the same as in Johannesburg:[41]

- Ensure that the living standards of the poor are progressively raised even as consumption choices of the rich become less resource-intensive and environmentally damaging
- Decouple economic growth from environmental degradation in relative and wherever possible absolute terms, consistent with poverty eradication and universal human development
- Stimulate demand for and supply of sustainable products and services
- Promote more sustainable and low-carbon consumption choices and lifestyles
- Enhance social development through investment in people and communities as highlighted, e.g., in a Global Green New Deal.[42]

63. In order to be meaningful, the programme may consider concrete targets. What would represent meaningful progress towards sustainable consumption and production by 2020? How are the goals to be differentiated across countries at different levels of development? One possible starting point for answering these questions is the set of regional priorities and strategies identified through regional implementation meetings of the Commission on Sustainable Development as well as under the umbrella of the Marrakech Process.

64. The African Round Table identified several obstacles to sustainable consumption and production. Some are relevant to all regions:[43]

(a) Poor education and lack of awareness of the benefits of sustainable consumption and production among all stakeholders;

(b) Government failures (lack of legislation and/or enforcement; weak recognition of sustainable consumption and production in most policies);

(c) Underpricing of natural resources and non-pricing of pollution.

65. Others are more particular to developing countries:

(a) Inadequate data on resource use efficiency and pollution; weak monitoring of economic activities which deplete resources and degrade the environment;

(b) Reliance on obsolete and inefficient technologies; lack of information and knowledge about sustainable management practices in various economic sectors;

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[41] Marrakech Process, "Proposed Input to the Commission on Sustainable Development at its eighteenth and nineteenth sessions on a 10-Year Framework of Programmes on Sustainable Consumption and Production". Third Public Draft (2 September 2009). See http://esa.un.org/marrakechprocess/draft10YFPInput.shtml.

[42] www.un.org/esa/policy/policybriefs/policybrief12.pdf and http://www.unep.org/greeneconomy.

[43] "Africa Review Report on Sustainable Consumption and Production" (African Round Table on Sustainable Consumption and Production, Dar es Salaam, 2008). See www.arscp.org.

(c) Lack of technical capacity (e.g., for product development and formulating bankable cleaner production projects; for design of effective and equitable sustainable consumption and production policies by Governments; for implementation of sustainable public procurement policies);

(d) Economic (lack of appropriate financing mechanisms for sustainable consumption and production investments; lack of financial incentives; widespread poverty);

(e) Organizational (weak institutions for designing and implementing policies and regulations; absence of collaborative projects and exchange programmes to facilitate knowledge-sharing at the regional level).

66. Other obstacles identified in other regional consultations and processes include:

- Lack of programmes to support small and medium enterprises and incentives for them to incorporate social and environmental management into their process (the Economic Commission for Latin America and the Caribbean (ECLAC) region)
- Lack of sustainable products available at affordable prices, especially food items that represent a large share of the poor's expenditures (the ECLAC region)
- Lack of adoption of more concrete goals and sustainable consumption and production targets at the regional and national levels (the Economic Commission for Europe (ECE) region)
- Lack of integrated policy appraisal
- Lack of engagement in changing lifestyles tailored to different social segments of society (the ECE region)
- Lack of policies to foster system innovations, enhance the internalization of externalities and shift from material-based consumption to "dematerialized" consumption
- Changing the role of government from regulator to agent of change supporting collective actions that engage all stakeholders.

67. The common programme must have the capacity to address the major strategic obstacles identified above. In terms of its components, it would need knowledge-sharing, access to tools and methodologies, training and technical support and capacity-building. A 10-year framework of programmes could, at a minimum, provide a way of organizing and sharing knowledge and information and of continually updating the knowledge base with new lessons generated from experience on the ground. Governments and other stakeholders could also benefit from access to tools and methodologies for promoting sustainable consumption and production across the full spectrum of economic decisions, from public procurement to management of global supply chains to cleaner production to sustainable consumption. Beyond consolidating tools into ready-at-hand toolkits, the programme could also usefully provide a platform for training government policymakers and other stakeholders in the use of the relevant tools. The programme could help decision makers to select and apply the proper mix of programmes and policies to address obstacles and barriers specific to countries, sectors and segments of society. Finally, the programme could usefully provide a vehicle to help to match actions at all levels with technical support and financial resources.